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RESOURCE INVENTORY TECHNIQUES USED IN THE CALIFORNIA DESERT CONSERVATION AREA

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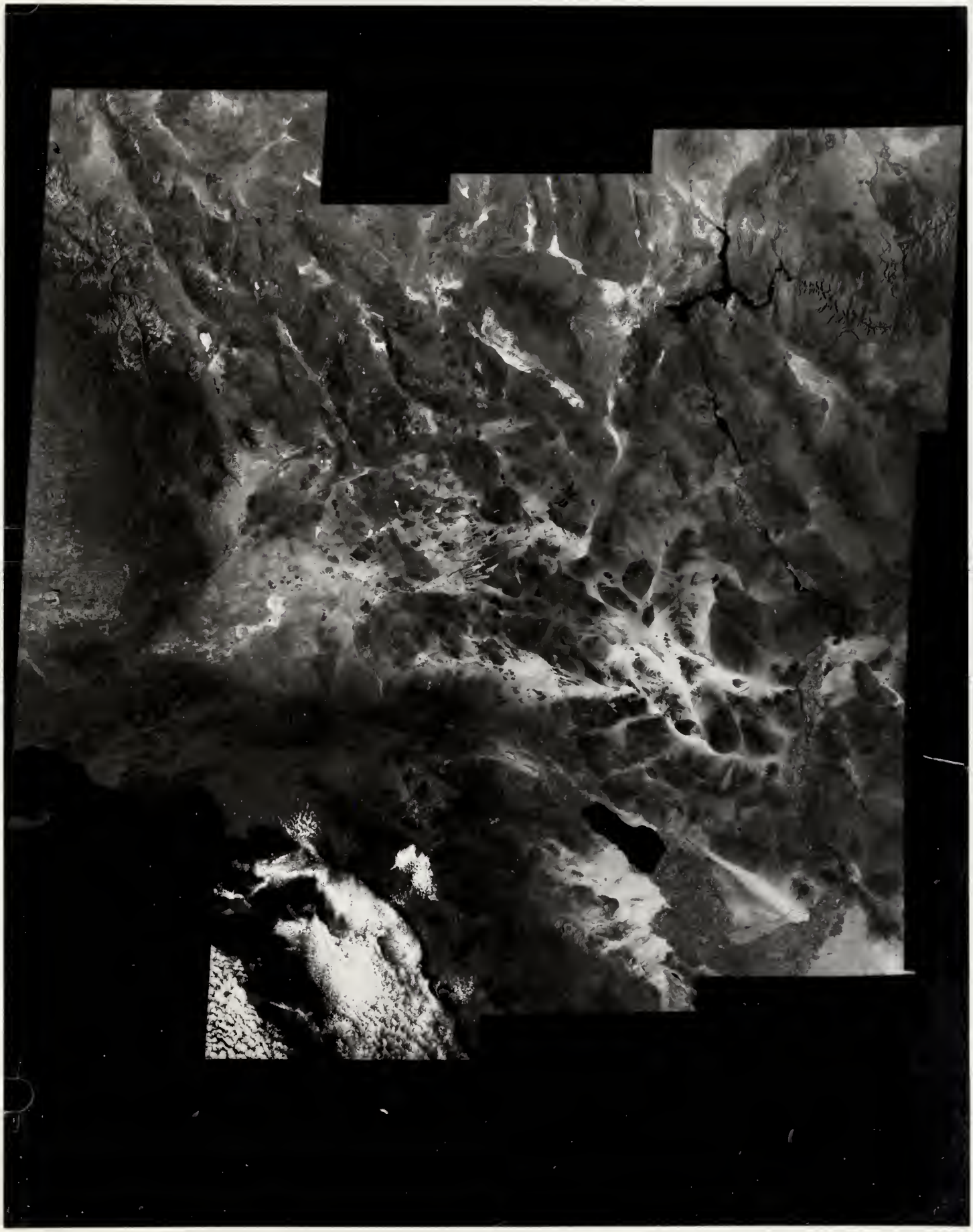
WORKSHOP ON RESOURCE INVENTORY TECHNIQUES USED IN THE CALIFORNIA DESERT CONSERVATION AREA

RON MCLEOD
JET PROPULSION LABORATORY
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

AND

ROBIN KOBALY
BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT DISTRICT
INDIO RESOURCE AREA

MARCH 4, 5, 1981



CALIFORNIA DESERT CONSERVATION AREA PROJECT

COOPERATIVE EFFORT BETWEEN
UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
DESERT PLAN STAFF, RIVERSIDE, CALIFORNIA
AND
THE JET PROPULSION LABORATORY
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

PURPOSE: TO ESTIMATE BIOMASS TO DETERMINE RANGE CARRYING CAPACITY USING REMOTELY SENSED AND CONVENTIONAL DATA SOURCES.

The CDCA

The California Desert Conservation Area encompasses 25 million acres and covers one-fourth of the State of California. It lies in the southeast quarter of California, skirting the Colorado River on the east and Mexico on the south. On the north and west are the peaks of the Sierra Nevada and, to the southwest across the coastal ranges, lies the metropolitan complex of southern California, from Santa Barbara, through Los Angeles, to San Diego. In the 1979 census, California's population was approximately 23 million people and over 12 million of those people lived in the 12 southern California counties. In increasing numbers, these people have been using the Desert lands and resources for recreation and solace.

Half of the CDCA's 25 million acres -- 12.1 million acres -- are public lands, managed by the Bureau of Land Management in trust for the people of the United States. These public lands are the target of the California Desert Plan.

The public lands in the CDCA probably have the widest array of ecosystems and environments within a single BLM management unit in the U.S. outside of Alaska. With a length of 350 miles and width of 250 miles, and a spread of elevation on public lands of almost 11,500 feet, a large number of natural forms and processes exist. The CDCA has many characteristics which distinguish it from woodland, grassland, and other major environments. It is typically desert -- a place where plants and animals have uniquely adapted to the harsh, dry environment. The three major subdivisions of the CDCA are the Mojave, Great Basin, and Sonoran Deserts. Each can be defined in terms of its own distinct varieties of plants and animals. The Great Basin is noted for its sagebrush; the Mojave for its creosote brush, yucca and Joshua trees; and the Sonoran for its ironwood and paloverde.

The desert ecosystems can be divided into still smaller units to reflect various mini-environments. Riparian systems are scattered throughout the CDCA and contain a rich diversity of plants and animals. Higher elevations, which receive more rainfall and are generally cooler than the rest of the Desert, often support stands of pinyon, juniper, and other woodlands. Unique desert landforms wuch as sand dunes and dry lakes or playas are micro-environments which contain plants and animals found nowhere else.

Compared to most deserts of the world, the California Desert is lush. Even the sand dunes of the Sonoran Desert, with less than 2 inches of annual precipitation, produce a variety of annual and perennial vegetation. Precipitation in the CDCA ranges by elevation and area from perhaps less than one inch to over 14 inches. Most of the public lands receive amounts in the 2-to-6-inch range.

Ecosystems in the CDCA result from the interaction of many factors -- elevation, soil, aspect or exposure, water, and wind. There are many different kinds of ecosystems. They often overlap or blend together at the edges, making it difficult to distinguish where one ends and another begins.

GENERAL VEGETATION

Only a few hundred of the approximately 2,000 species of plants in the California Desert contribute significantly to the vegetational aspect. Vegetation of the CDCA is comprised of small trees, shrubs, succulents, and herbs. Herbs are represented by perennial and annual types. These growth forms may occur almost exclusive of one another or, more commonly, are intermingled to make complex vegetation patterns

Desert scrub and shrubland occupies approximately 80 percent of the CDCA. The bulk of the plant biomass is made up of shrubs. Shrub ground cover ranges from less than one percent to over forty percent. Stands of creosote bush and its common shrub associate burro bush are the most significant contributors and dominate much of the desert landscape. These two species exhibit a broad ecological amplitude that enables them to occupy vast areas of the hotter and dryer portions of both the Colorado and Mojave Deserts below 4,000 feet. They do not occupy more than a few percent of the CDCA.

Small tree woodlands fall into two categories: conifer stands (mostly juniper and pinyon) above 5,180 feet in the desert mountains, and stands of deciduous trees (mostly paloverde, ironwood, and desert willow) of the low elevation washes. Together they occupy approximately 10 percent of the CDCA, the former being distributed mostly in the Mojave and the latter in the Colorado Desert. Although the area occupied by these woodlands is small when compared with the shrublands, their productivity is high and contributes significantly to the total biological activity of the desert region. Vegetation containing Joshua trees (Yucca brevifolia) may also be designated as woodland, but since this species usually grows well dispersed in a variety of shrub and grassland communities at mid-elevations throughout the Mojave, such a unit is not easily defined. In addition to having tree stature, Joshua trees also have a structure and metabolism similar to that of cacti and other succulents.

Succulents have a distinctive type of metabolism that is significant in understanding desert vegetation. They are sometimes considered specialized types of shrubs generally having about the same stature. However, they exhibit distribution patterns related to their unique physiology that sets them apart. All the members of the cactus and agave plant families (Cactaceae and some Agavaceae), particularly Agave, belong in this category. Members of these families dominate the vegetational composition in parts of the Colorado Desert at elevations between 3,000 and 4,000 feet.

Vegetation in which herbs may predominate in the desert are of two types, perennial grasslands and stands of annual forbs and grasses. Perennial grasslands occur in the east Mojave at elevations between 4,000 and 5,500 feet. They also occur at lower elevations on sand sheets covering slopes and valleys. Perennial grasses are especially prominent following years of high rainfall. The principal perennial grass species throughout most of the Desert is big galleta grass. Grasslands occupy less than 5 percent of the CDCA.

Stands of annual forbs and grasses occur extensively throughout the CDCA in a remarkable on-again, off-again sequence related to frequency and intensity of precipitation. High, evenly spaced rainfall during the fall and winter commonly results in spectacular wildflower displays the following spring. Intense summer storms bring on the rapid development of an entirely different set of annual species

that complete their entire life cycle in a matter of weeks. The development of both spring and summer displays fail completely in the absence of rain. Spring displays are more frequent in the southwestern Mojave. Summer displays are more characteristic of the eastern Mojave and upper Colorado portions of the CDCA. The species of winter annuals number into the hundreds, but there are just over a dozen summer annuals. This component of the vegetation is of great importance to livestock.

APPROACH TO THE PROBLEM

HYRUM JOHNSON
FORMERLY LEAD RANGE CONSERVATIONIST
BUREAU OF LAND MANAGEMENT
DESERT PLAN STAFF, RIVERSIDE, CALIFORNIA

TECHNIQUES:

- MULTISPECTRAL CLASSIFICATION
- LOW LEVEL AERIAL PHOTO INTERPRETATION
- FIELD WORK AND GROUND DATA COLLECTION
- DATA INTEGRATION

A MULTI-STAGE APPROACH

MULTISTAGE SAMPLING STRATEGY

- FIELD WORK
- LOW LEVEL AERIAL PHOTOGRAPHY
- MEDIUM LEVEL AERIAL PHOTOGRAPHY
- HIGH ALTITUDE U-2 PHOTOGRAPHY
- ORBITAL ALTITUDE DIGITAL IMAGERY - LANDSAT

RATIONALE FOR MULTI-STAGE AUTOMATED APPROACH

- EFFICIENT USE OF MULTIVARIATE INFORMATION
- COMPLEX CASE REQUIRES LOTS OF INFORMATION
- DESIRE FOR ANALYTICAL, REPEATABLE PROCESS
- TIME CONSTRAINTS
- BUDGET CONSTRAINTS

REGISTRATION OF MULTIPLE DATA TYPES

- POTENTIAL FOR IMPROVEMENT IN CLASSIFICATION PERFORMANCE
- ALL DATA TYPES ARE GEO-REFERENCED FOR EASY COMPARISON
- TABULATION OF RESULTS BY GRAZING ALLOTMENT AND LAND OWNERSHIP

DISPARATE DATA TYPES

- DIGITAL IMAGES
- CONVENTIONAL MAP SHEETS
- FIELD INFORMATION
- FLORISTIC DATA
- SOILS DATA
- CLIMATIC DATA

ALL SEPARATE DATA VARY IN:

- QUALITY
- QUANTITY

CONFLICTS AND CONSTRAINTS

- TIME LIMITS
- BUDGET LIMITS
- SIZE OF THE STUDY AREA

RESEARCH AND DEVELOPMENT TASK OPERATING
IN AN APPLICATIONS MODE

- FEW WILLING TO TAKE ON TASK

- NO CLEAR CUT PATH TO RESULTS

REMOTE SENSING AND THE LANDSAT SYSTEM

NEVIN BRYANT
JPL

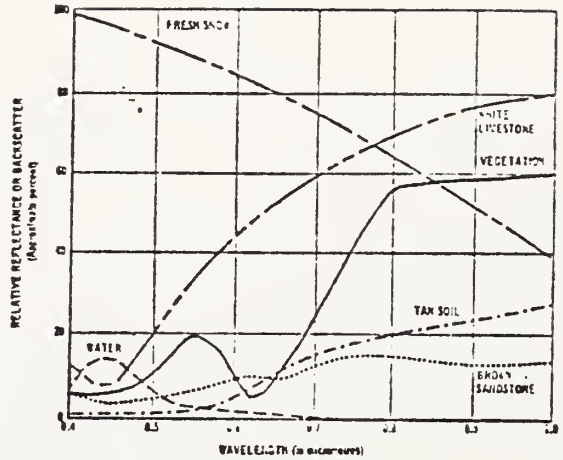
Table 1 – Representative space and aerial image scale characteristics.

Scale Factor	Feet per Inch	Area Covered per Frame (9" x 9" Film Format) Statute Miles	Nautical Miles	Comments
1 1,000,000	83,333	115 x 115	100 x 100	LANDSAT (ERTS) images enlarged to this scale (3.7X)
1:715,000	59,583	101 x 101	88 x 88	Skylab S-190A photos enlarged to this scale (4X)
1:473,000	39,417	68 x 68	59 x 59	Skylab S-190B photos enlarged to this scale (2X)
1:130,000	10,833	18.5 x 18.5	16 x 16	Typical NASA U-2 image scale/format, 6" focal length
1:120,000	10,000	17 x 17	14.8 x 14.8	Typical NASA RB-57 image scale/format, 6" focal length
1:80,000	6,666	11.4 x 11.4	9.9 x 9.9	Typical USGS "High altitude" photo scale for mapping
1:63,360	5,280	9 x 9	7.8 x 7.8	1 mile per inch scale – Alaska topographic quadrangle map series
1:50,000	4,167	7.1 x 7.1	6.2 x 6.2	Will become more common scale as metric system adopted
1 40,000	3,333	5.7 x 5.7	4.9 x 4.9	Typical scale (current) of USGS and USDA mapping photography
1:24,000	2,000	3.4 x 3.4	3 x 3	Scale of USGS standard topographic map series (7½' quadrangles)
1 20,000	1,667	2.8 x 2.8	2.5 x 2.5	Typical scale of older USDA and USGS mapping photography
1 15,840	1,320	2.25 x 2.25	2 x 2	Typical scale of Forest Service photography – ¼ mile per inch
1:12,000	1,000	1.7 x 1.7	1.5 x 1.5	Typical "large" scale for detailed photogrammetric surveys
1 4,800	400	0.7 x 0.7	0.6 x 0.6	Very large scale for detailed surveys – usually very limited area
1 2,400	200	1/3 x 1/3	0.3 x 0.3	Very large scale for detailed surveys – usually very limited area

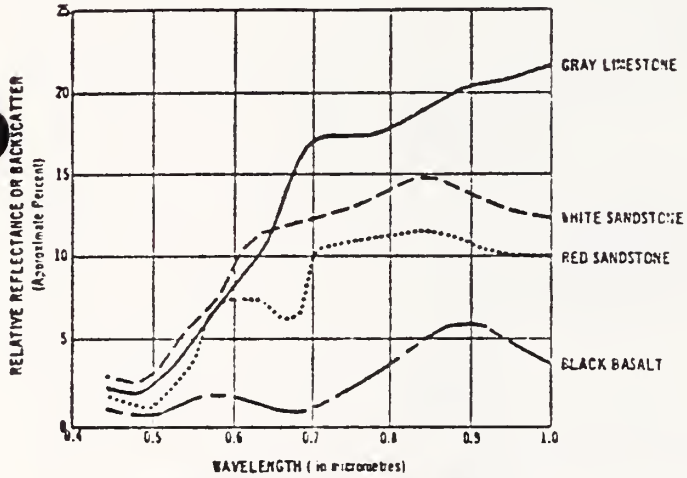
THE ELECTROMAGNETIC SPECTRUM

- SPECTROREFLECTANCE
- ABSORPTION CHARACTERISTICS

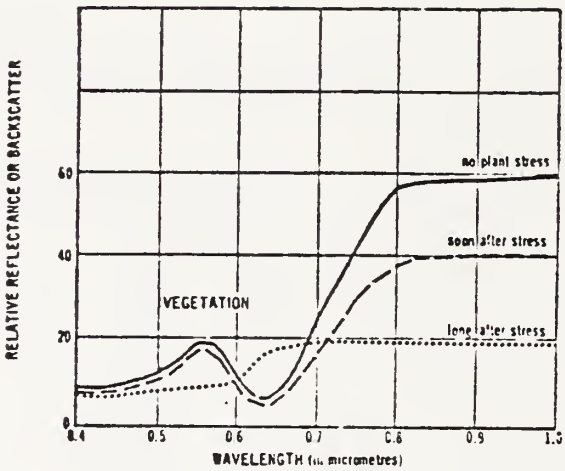
IDEALIZED CURVES SHOWING RELATIVE REFLECTANCE OR BACKSCATTER FROM COVER TYPES



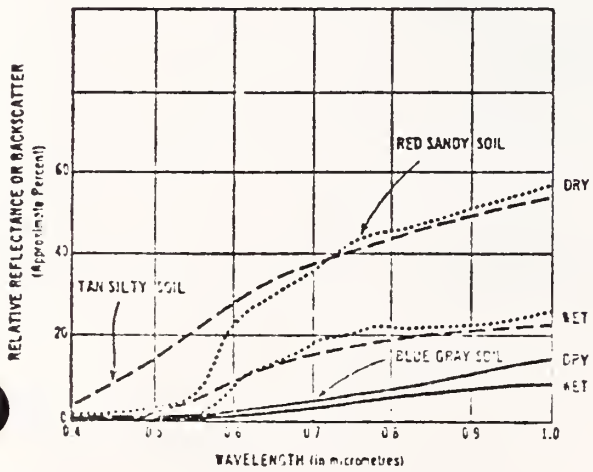
General spectral characteristics of main cover types
Some data from G. Moore, personal communication



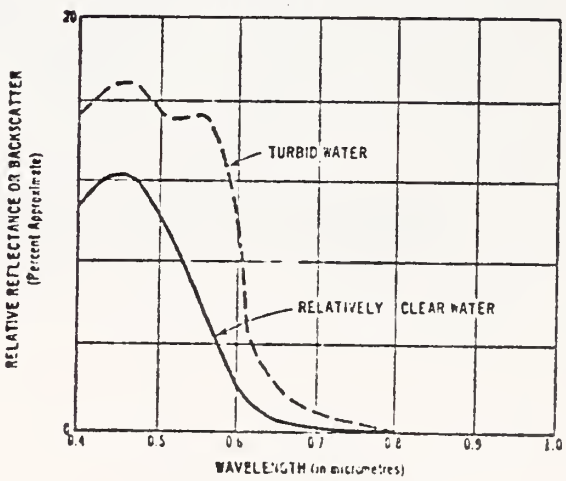
Spectral characteristics of rock types. Data in unpublished form furnished by Orr and from visual analysis



Spectral characteristics of vegetation showing decrease in infrared response because of stress. Data from Remote Sensing in Ecology, Philip L. Johnson Ed., 1969



Spectral characteristics of Soils, data from H.R. Condit, 1970



Spectral characteristics of backscattered EMR from water. Data from Polcyn and Lyzenga, 1973 and G. Moore personal communication.

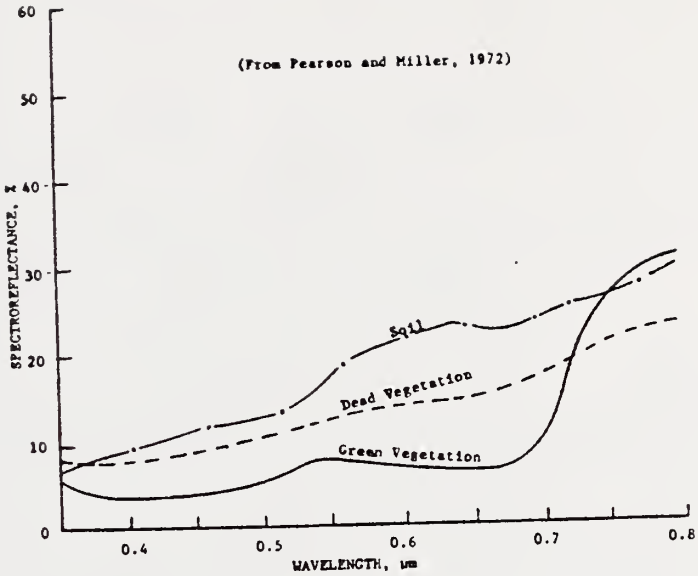


Fig. 1 Spectroreflectance of Soil, Dead Vegetation and Green Vegetation.

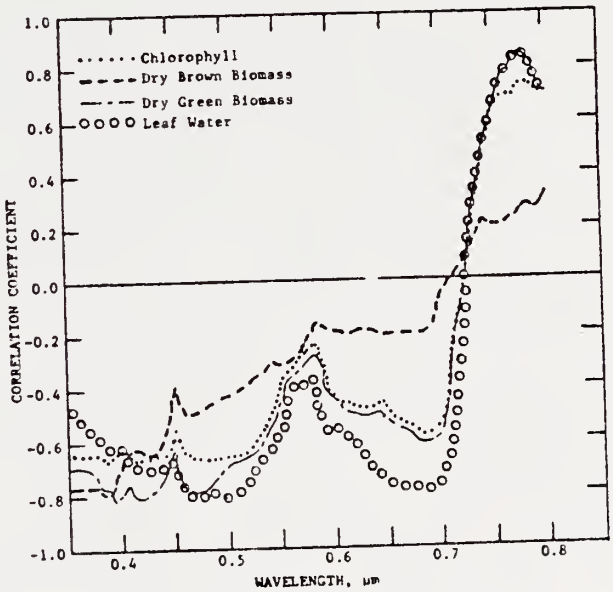


Fig. 2 Correlation Between Spectroreflectance and Leaf Water, Dry Green Biomass, Dry Brown Biomass and Chlorophyll. (From Tucker, 1973)

THE LANDSAT SYSTEM

CHARACTERISTICS:

- LAUNCH DATES

LANDSAT-1	23 JULY 1972
LANDSAT-2	22 JAN 1975
LANDSAT-3	05 MARCH 1978

- ORBITAL PARAMETERS

ALTITUDE	900-960KM
INCLINATION	99°
PERIOD	103 MINUTES
TIME OF DESCENDING NODE, EQUATOR	9:42AM
SWATH WIDTH	185KM
REPEAT COVERAGE	18 DAYS

- GROUND RECEIVING

U.S. STATIONS	GODDARD SPACE FLIGHT CENTER GOLDSTONE, CALIFORNIA FAIRBANKS, ALASKA

THE MULTISPECTRAL SCANNER

OPERATION

- SWATH WIDTH 186.2KM
- SCANNING BY MEANS OF OSCILLATING MIRROR (13.62 CYCLES PER SECOND) AND SPACECRAFT MOTION. SIX DETECTORS IN EACH SPECTRAL BAND, SO 6 SCAN LINES OBTAINED WITH EACH MINOR OSCILLATION.

SPECTRAL RESOLUTION AND SENSITIVITY

- FOUR WAVELENGTH BANDS:

BAND 4	0.5 - 0.6 M (GREEN)
BAND 5	0.6 - 0.7 M (RED)
BAND 6	0.7 - 0.8 M (NEAR INFRARED)
BAND 7	0.8 - 1.1 M (NEAR INFRARED)

- EACH DETECTOR ANALOG SIGNAL IS ENCODED AS A 6 BIT (64 LEVEL) DIGITAL WORD WITH EACH WORD CORRESPONDING TO A PIXEL. SIGNAL COMPRESSION IS GENERALLY EMPLOYED TO IMPROVE THE SIGNAL TO NOISE RATIO IN BANDS 4, 5, 6, BUT NOT IN 7. AS RECEIVED FROM EROS, BANDS 4, 5, 6, HAVE 128 DISCRETE LEVELS WHILE 7 HAS 64 DISCRETE LEVELS.

IMAGE GEOMETRY ON RESOLUTION

- EACH IMAGE IS COMPOSED OF PICTURE ELEMENTS CALLED "PIXELS". FOR BANDS 4-7, THERE ARE 3,240 PIXELS IN THE ACROSS TRACK DIRECTION AND 2,340 IN THE ALONG TRACK DIRECTION. EACH PIXEL IS TREATED SPATIALLY AS AN AREA 57 METERS X 79 METERS, BUT REPRESENTS DATA FROM AN AREA 79 METERS SQUARE, WHICH IS THE INSTANTANEOUS FIELD OF VIEW (IFOV) OF THE SCANNER. THE DIFFERENCE IN THE SIZE OF THE PIXELS AND IFOV IS THE RESULT OF OVER SAMPLING ALONG SCAN LINES.

  1 PIXEL 1.1 ACRES .44HA

- DUE TO THE EARTHS ROTATION, EACH SCAN LINE BEGINS SLIGHTLY WEST OF THE PREVIOUS LINE. THUS THE AREA IMAGED IN A SCENE HAS SKEW AND IS A PARALLELOGRAM.

DATA AVAILABLE

- HARD COPY PHOTOS, B&W AND COLOR NEGS AND TRANSPARENCIES

- CCT'S (COMPUTER COMPATIBLE TAPES)
    - BAND INTERLEAVED - RAW
    - BAND SEQUENTIAL - CORRECTED MDP PRODUCT

OVERVIEW OF INVENTORY TECHNIQUES

RON MCLEOD
JPL

OVERVIEW OF INVENTORY TECHNIQUES

COMPILATION OF DATA SOURCES

- LANDSAT DIGITAL MOSAIC
- DIGITAL TERRAIN DATA
- ANCILLARY GROUND INFORMATION
- CADASTRAL INFORMATION

MULTI-SPECTRAL CLASSIFICATION

- STATISTICS GATHERING
- STATISTICS REDUCTION
- TESTING STATISTICS

LOW LEVEL TRANSECT INTERPRETATION

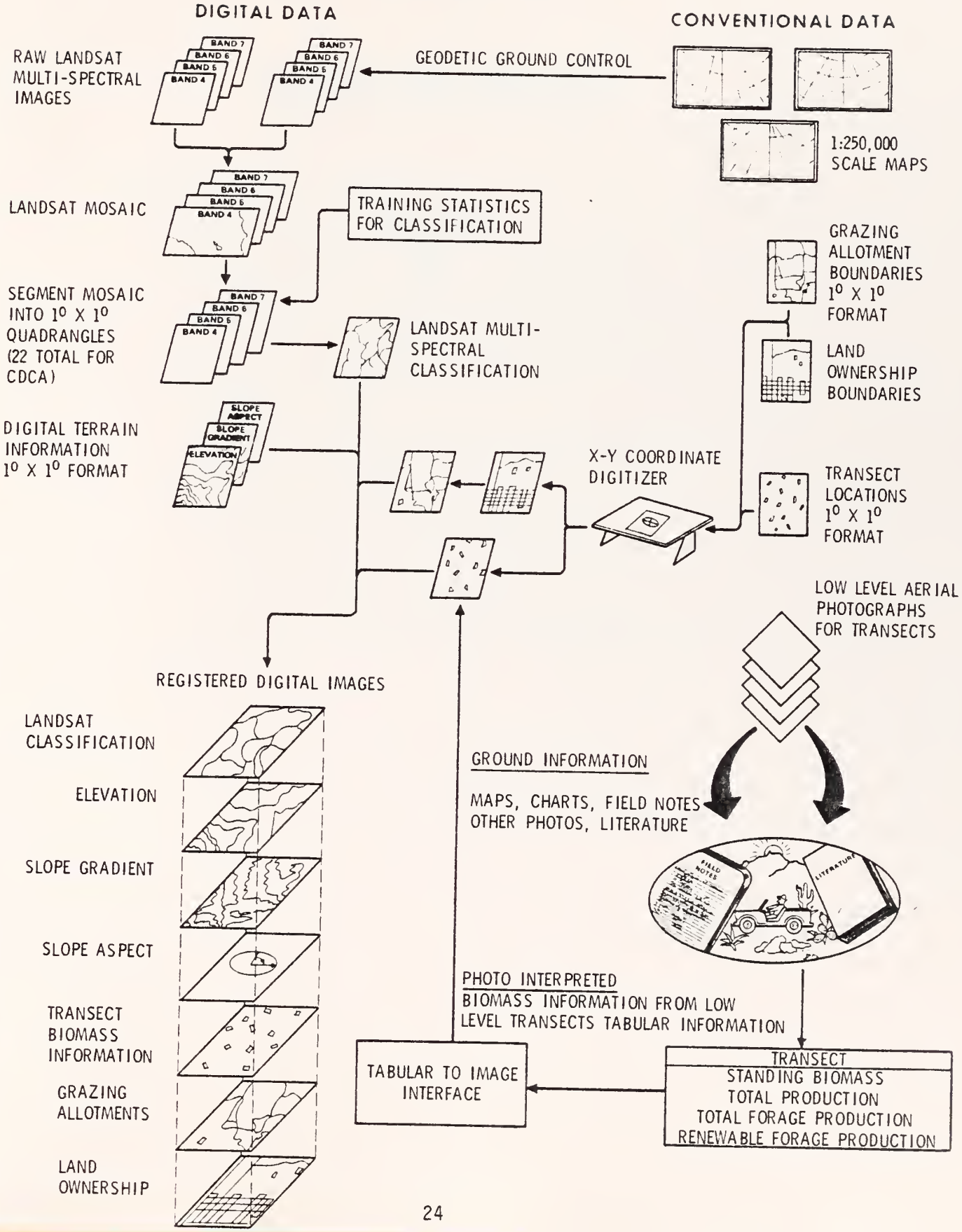
- BIOMASS
- PRODUCTION

DATA INTEGRATION (BACK-CLASSIFICATION)

DATA AGGREGATION

- LAND OWNERSHIP
- GRAZING ALLOTMENTS
- SLOPE CATEGORY

BIOMASS AND RANGE CARRYING CAPACITY ESTIMATION DATA SOURCE COMPILATION AND INTEGRATION



COLLATERAL DATA INTEGRATION

RON MCLEOD
JPL

COLLATERAL DATA INTEGRATION

- LANDSAT DIGITAL MOSAIC
    - 10 ORIGINAL FRAMES
    - RESAMPLED TO 80 METER SQUARE PIXELS
    - PROJECTED TO LAMBERT CONFORMAL CONIC
    - IMAGERY ACQUIRED ON 4 CONSECUTIVE DAYS IN AUGUST OF 1976
    - BRIGHTNESS ADJUSTED IN OVERLAP AREAS
    - FINAL IMAGE SIZE -

      7400 LINES BY 7500 SAMPLES

      55.5 MEGABYTES PER BAND
    - SEGMENTED INTO 1° X 1° QUADRANGLES

COLLATERAL DATA INTEGRATION

- DIGITAL TERRAIN INFORMATION

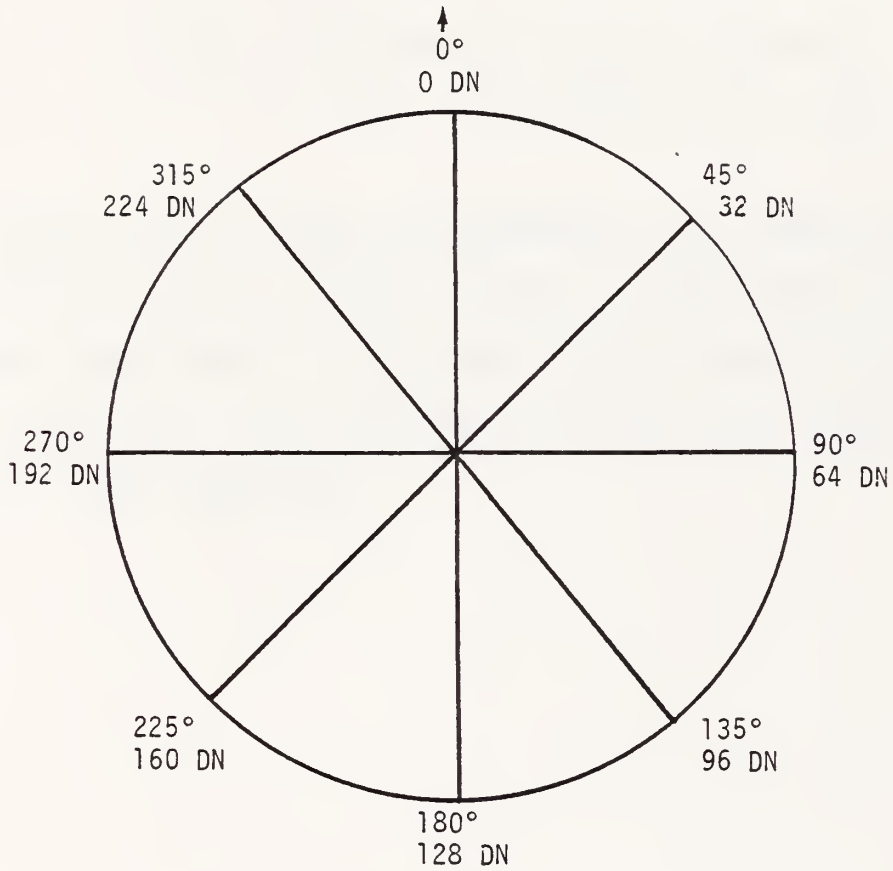
  SOURCE: DEFENSE MAPPING AGENCY (DMA) AND NATIONAL CARTOGRAPHIC INFORMATION CENTER (NCIC). DIGITIZED FROM THE 1:250,000 SCALE SERIES MAPS.

- ELEVATION
  - DIGITAL DATA IS LOGGED IN AN ELEVATION IMAGE
  - THE ELEVATION IMAGE IS A BRIGHTNESS SURFACE FROM 0 - 255 ON A BRIGHTNESS SCALE (8 BIT). THE DATA IS SCALED FROM 0 - 10,000 IN 256 LEVELS. (BRIGHTNESS VALUES ARE CALLED DN'S).
  - 0 DN = 0 FEET ELEVATION 255 DN = 10,000 FEET 1 DN = 39.22 FEET

- DERIVED MEASURES OF ASPECT AND GRADIENT
  - ASPECT - DIRECTION IN WHICH SLOPE FACES. AZIMUTH IMAGE.

SLOPE ASPECT SHADING KEY

TOP OF IMAGE



BOTTOM OF IMAGE

EXAMPLE: A PORTION OF THE IMAGE WITH DN VALUES OF 128 WOULD BE SLOPES FACING TOWARDS THE BOTTOM OF THE IMAGE OR SOUTH IF IMAGE ORIENTATION IS NORTH/SOUTH. FOR LANDSAT QUADS SUBTRACT 12° ON CHART TO OBTAIN NORTH/SOUTH ORIENTATION.

- GRADIENT - STEEPNESS OF SLOPE IN DEGREES
  0 DN - 0°, 255 DN = 90°, 1 DN = $.35^{o}$

SINCE DIGITAL TERRAIN INFORMATION IS IN A MAP PROJECTION EACH PIXEL HAS A KNOWN LOCATION. THESE KNOW LOCATIONS ARE REGISTERED TO THE LANDSAT DIGITAL MOSAIC ALSO IN A MAP PROJECTION, THUS ACHIEVING PIXEL FOR PIXEL REGISTRATION FOR EASY COMPARISON.

LOW LEVEL AERIAL TRANSECTS

HYRUM JOHNSON
BLM

LOW LEVEL AERIAL PHOTO TRANSECTS

PURPOSE: TO PROVIDE QUANTITATIVE INFORMATION ON BIOMASS OF PERENNIAL PLANTS THROUGHOUT THE CDCA.

LIMITATIONS OF LARGE SCALE PHOTO TRANSECTS

* SPECIES IDENTIFICATION

    - RESOLUTION MAY LIMIT PRECISION OF IDENTIFICATION

    - SMALL PERENNIAL PLANTS LIKELY TO BE MISSED

    - ANNUAL PLANTS CANNOT BE IDENTIFIED

    - GROUND VERIFICATION OF SOME SPECIES REQUIRED

    - SPECIES RICHNESS?

* CONTROL OF SCALE

    - ACCURACY OF PLANT MEASUREMENTS DECREASES AS SCALE BECOMES SMALLER

BENEFITS OF LARGE SCALE PHOTO TRANSECTS

* MEASUREMENT OF COVER AND PHYTOMASS MORE ACCURATE IN REPRESENTING TOTAL TRANSECT AREA THAN MEASUREMENTS OBTAINED FROM GROUND SAMPLES ALONE.

  + PHOTO TO LANDSAT SCENE PROVIDES EASIER INTEGRATION THAN GROUND TRANSECT TO LANDSAT SCENE

* GROUND CHECKING MINIMIZED

* ALLOWS SAMPLING FROM AREAS OF DIFFICULT ACCESS, I.E., REMOTE AREAS AND ROUGH TERRAIN

* PROVIDES ACCURATE PERMANENT RECORD FOR A GIVEN POINT IN TIME

  + MAY REPHOTOGRAPH IN FUTURE AND APPLY SAME METHODOLOGY (MONITORING AND UPDATING)

CRITERIA FOR SELECTION OF LOW LEVEL PHOTO TRANSECTS

* SITES SELECTED TO REPRESENT BOTH GEOGRAPHIC AND BIOLOGICAL DIVERSITY WITHIN THE CDCA

* SITES SELECTED IN AREAS OF SPECIAL SIGNIFICANCE TO MANAGEMENT:
  - GRAZING ALLOTMENTS
  - RIPARIAN AREAS
  - OFF ROAD VEHICLE OPEN AREAS

* SITES SELECTED IN AREAS WHERE GROUND INFORMATION AVAILABLE (FOR VERIFICATION)

SPECIFICATIONS OF LOW LEVEL AERIAL PHOTO TRANSECTS

CONTRACT: APPROX. $40,000 FOR 500 TRANSECTS, OR APPROX. $80 PER TRANSECT

CAMERA: ZEISS RMKA-21-23 MAPPING CAMERA

LENS: TOPARON 8 1/4"

FOCAL LENGTH: 208.09MM

SHUTTER SPEED RANGE: 1/200 SEC. - 1/1000 SEC.

FILM: HIGH SPEED COLOR TRANSPARENCY FILM (SO397)

FORMAT: 9" x 9"

SCALE: 1:1,000

SEASONS: EARLY FALL, 1978 TO SPRING, 1979.

CADASTRAL INFORMATION INTEGRATION

KEVIN HUSSEY
JPL

CADASTRAL INFORMATION DIGITIZATION

- PURPOSE: TRANSFER CADASTRAL INFORMATION FROM PRINTED MAPS (PAPER) TO DIGITAL MAPS (MAGNETIC TAPE).
- CADASTRAL INFORMATION DIGITIZED
  - GRAZING ALLOTMENTS
  - PUBLIC VS. PRIVATE LAND OWNERSHIP
- PROCEDURE
  - PREPARE MAPS FOR DIGITIZER
  - DIGITIZE BOUNDARIES WITH COORDINATE DIGITIZER
  - GENERATE BOUNDARY IMAGES
  - OVERLAY BOUNDARY IMAGES ON LANDSAT TO CHECK REGISTRATION
  - EDIT BOUNDARY IMAGES
  - UNIQUELY ENCODE EACH OF THE 52 GRAZING ALLOTMENTS "PAINTING"
  - STORE DIGITAL MAPS ON MAGNETIC TAPE

- RESULTS: TWO DIGITAL MAPS FOR EACH ONE DEGREE QUADRANGLE
  - UNIQUELY ENCODED GRAZING ALLOTMENTS
  - PUBLIC VS. PRIVATE LAND OWNERSHIP

TRONA

EDITION 5

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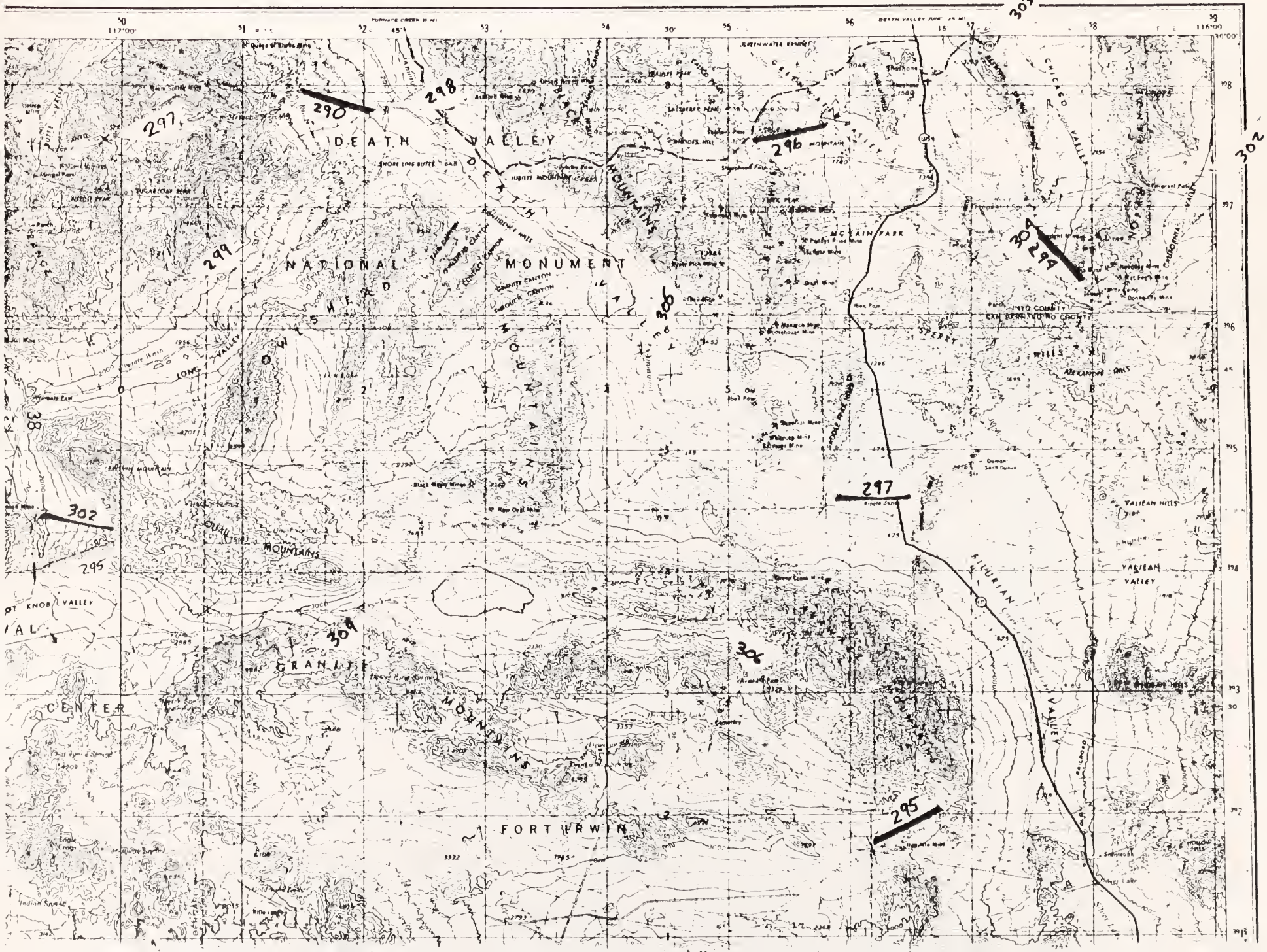
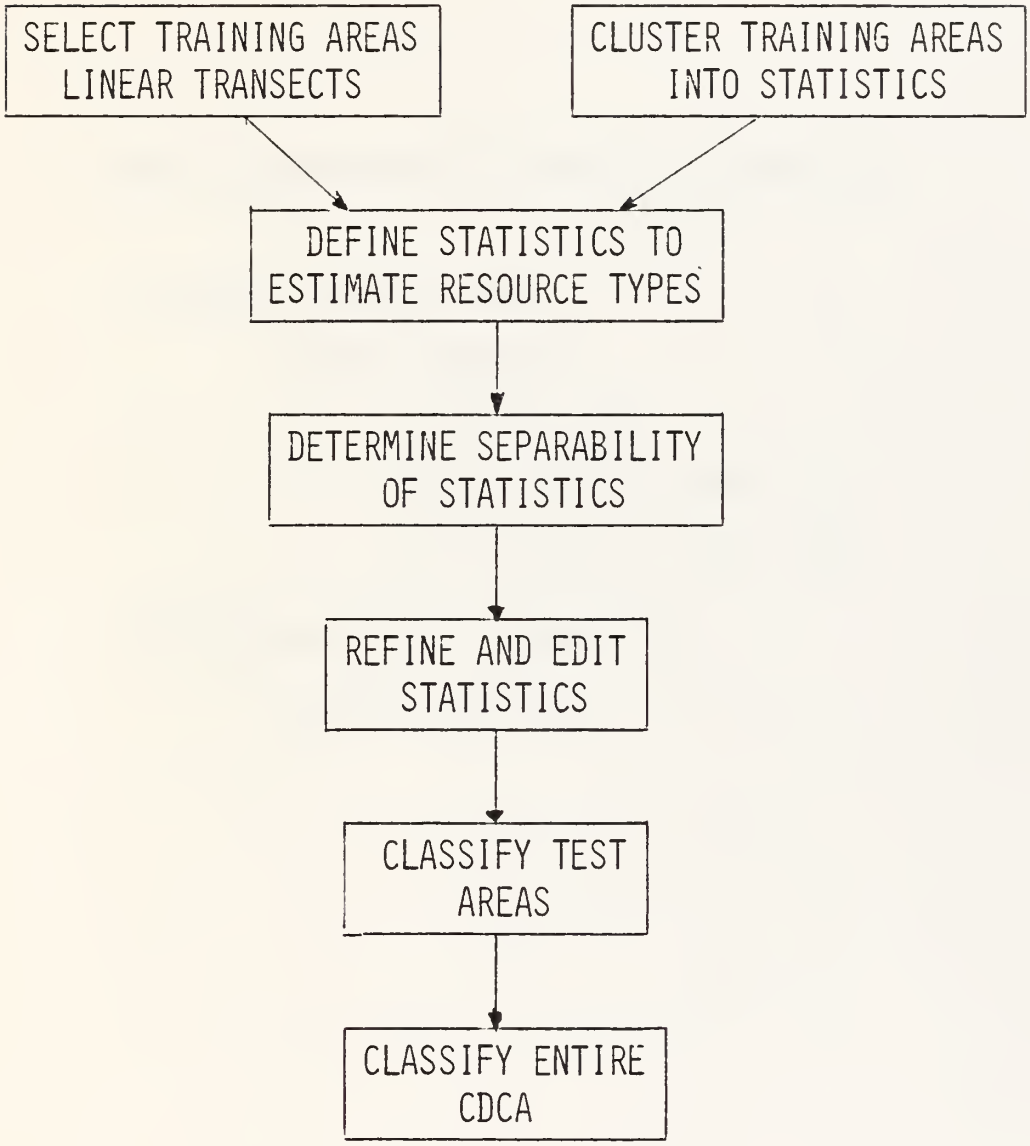
SERIES V502



MULTISPECTRAL CLASSIFICATION PROCEDURES

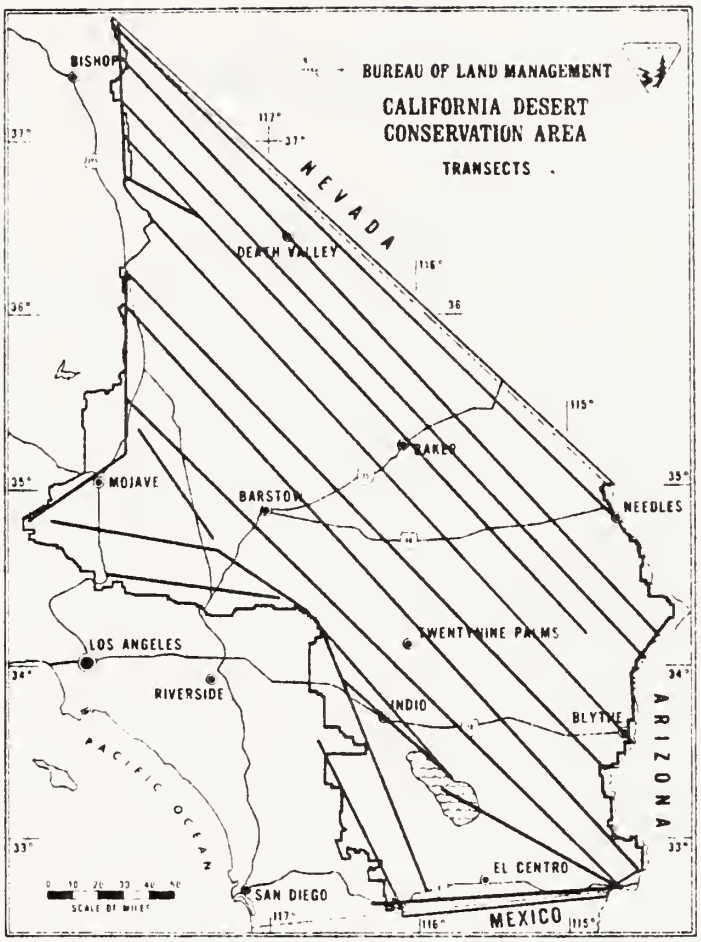
RON MCLEOD
HYRUM JOHNSON

MULTI-SPECTRAL CLASSIFICATION PROCEDURES



INDUCTIVE APPROACH TO STATISTICS GENERATION

- "BIASED" TRAINING AREAS
    - LINEAR TRANSECTS
        - 2 PIXELS WIDE
        - TOTAL LENGTH 3,000 MILES
        - 0.5% SAMPLE OF TOTAL CDCA
- DATA DECIDES WHAT INFORMATION CAN BE EXTRACTED



LINEAR TRANSECTS USED

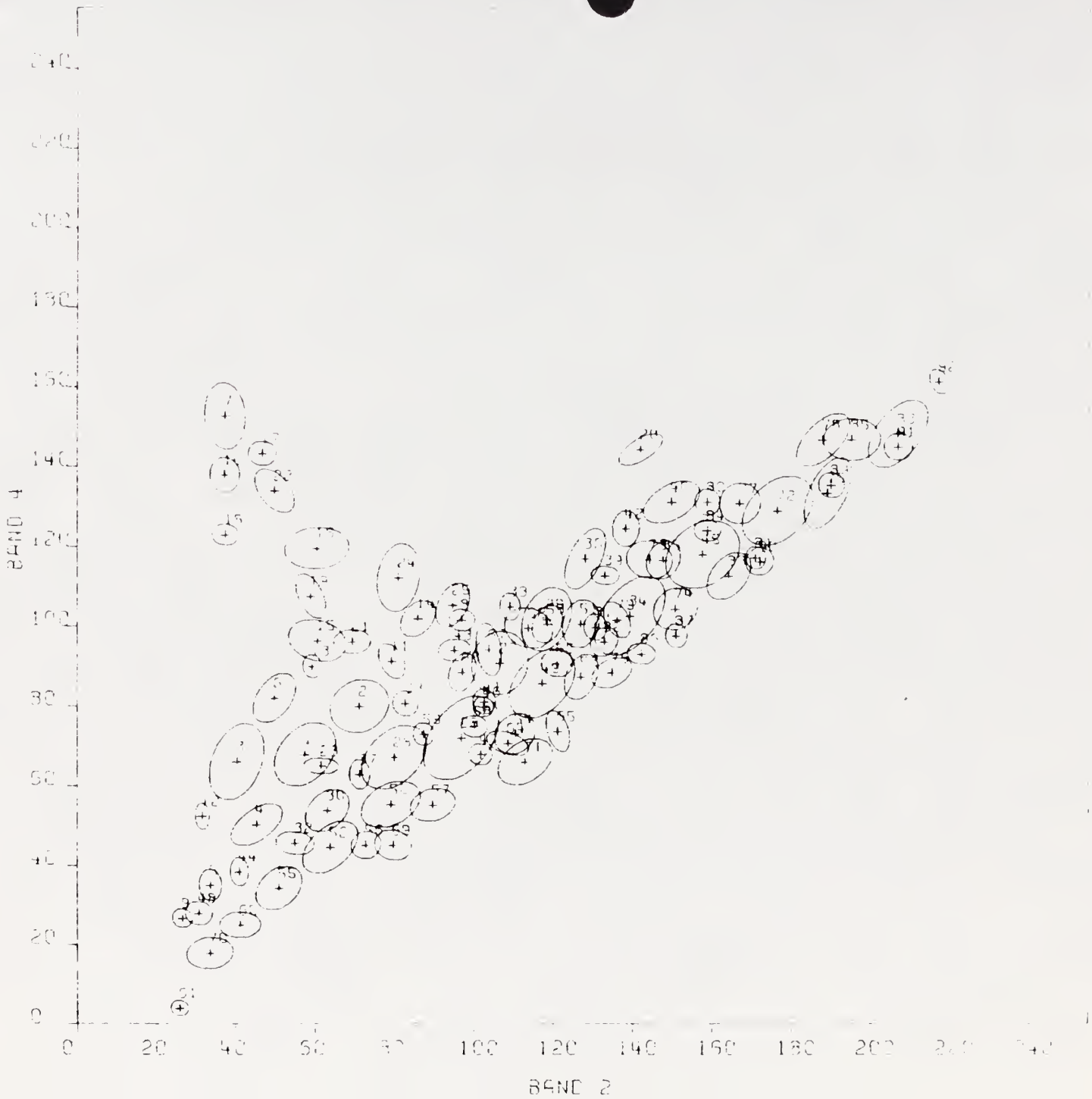
FOR STATISTICS GATHERING

CLUSTER REDUCTION

HYRUM JOHNSON

STATISTICS GATHERED

- CLUSTERING ALGORITHM
    - LIMITS GROWTH OF CLUSTERS
    - PROVIDES LARGE SET OF INITIAL CLUSTERS (1993)
- CLUSTER EDITING
    - VISIBLE TO INFRARED RATIO
    - REDUCE TO 100 PRINCIPLE CLUSTERS
- CLUSTER DISPLAY
    - PLOT
    - PRINTOUT OF STANDARD DEVIATIONS AND MEANS
- CLUSTER ANALYSIS
    - TEST AREA SELECTION
    - IMAGE 100 ANALYSIS
    - REFINEMENT
    - DIGITAL TERRAIN INTERFACE STUDY
- FINAL STATISTICS
    - APPLY TO ENTIRE CDCA 22 1° X 1° QUADS


BAND 4
BAND 2

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA
DIGITAL MOSAIC PRIMARY TEST AREA ANALYSIS

SALINE VALLEY TEST AREA

TWO STRATA CLASSIFICATION APPROACH
CLASSIFICATION SIGMA THRESHOLD EQUALS 3.0
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CLASS NUMBER	NUMBER OF PIXELS	BAND 4 GREEN MEAN	BAND 4 GREEN SIGMA	BAND 5 RED MEAN	BAND 5 RED SIGMA	BAND 6 IR1 MEAN	BAND 6 IR1 SIGMA	BAND 7 IR2 MEAN	BAND 7 IR2 SIGMA
0	4398	56.58	67.05	56.54	73.10	53.03	65.44	56.98	46.30
1	4128	62.06	3.81	59.73	4.51	71.71	4.44	65.27	4.48
2	2749	71.23	3.82	72.00	4.28	84.70	4.03	76.21	3.90
3	73	50.49	2.02	45.22	2.76	60.04	3.61	59.55	4.04
4	2703	53.38	3.65	47.86	4.43	56.10	4.88	49.36	5.00
5	1275	44.03	2.54	34.58	2.74	35.05	2.66	32.14	3.45
6	13	59.85	2.93	49.46	3.86	82.77	2.91	80.08	5.94
8	49	90.12	4.01	97.08	2.32	105.29	2.75	96.31	1.67
14	34	85.56	3.51	85.44	3.04	108.16	2.68	99.94	3.76
15	23	67.04	4.63	60.96	7.02	100.70	4.31	102.48	4.32
16	21	68.19	6.26	61.57	7.21	111.57	4.02	116.57	4.78
19	20	67.95	2.97	62.00	3.56	104.95	3.04	107.15	2.95
21	11	76.18	3.56	72.36	3.17	102.91	1.44	97.45	2.64
23	127	66.36	2.05	65.56	2.32	75.13	1.73	66.04	1.73
24	43	76.68	3.13	76.09	3.24	108.79	4.20	105.88	4.32
25	37	94.41	3.52	96.41	4.31	115.61	4.16	103.30	5.38
26	19683	76.13	4.28	77.76	5.14	81.45	5.06	66.30	5.17
27	3986	96.13	4.13	104.16	4.27	107.55	4.09	88.82	4.17
28	6654	85.86	3.79	92.33	3.79	96.30	3.30	79.64	4.36
29	1896	106.85	4.39	116.92	4.55	115.7[illegible]	4.45	98.02	4.87
30	9476	65.75	3.55	63.20	3.76	66.34	3.58	53.59	4.17
31	2399	85.27	2.26	89.10	1.95	90.66	1.89	70.92	2.47
32	109	116.72	3.40	127.90	1.75	125.34	1.81	102.80	2.65
33	3800	58.35	2.83	53.91	3.19	56.32	2.81	44.59	2.76
34	1543	76.54	2.44	82.42	2.44	91.34	2.19	79.25	2.52
35	145	114.94	3.61	131.01	2.66	135.37	2.41	108.66	2.66
36	88	124.75	3.19	142.17	2.56	144.27	2.98	116.77	3.39
37	41	107.36	3.35	123.51	2.90	130.73	2.96	110.98	4.71
38	1245	66.91	1.66	69.68	1.99	74.49	1.97	62.87	2.64
39	29	95.79	2.24	108.07	2.30	118.34	2.71	102.14	2.78
40	111	120.88	2.87	133.34	3.43	135.77	2.92	112.41	2.53
41	126	128.24	4.89	147.34	5.56	150.95	5.25	126.38	4.03
42	1030	92.54	2.03	94.99	2.36	96.62	2.09	77.61	2.66
43	141	87.44	1.58	100.72	1.78	103.28	1.71	82.29	2.11
44	14	115.36	1.59	135.07	2.22	139.36	3.11	118.64	2.32
45	110	83.06	2.56	92.51	2.84	103.69	2.38	92.25	2.22
46	1477	44.44	2.23	41.97	2.48	45.66	2.01	37.17	3.02
47	13	135.54	3.10	152.54	3.13	154.38	3.32	120.85	1.88
48	584	93.99	2.48	102.29	1.81	104.18	1.66	81.03	2.10
49	18	97.11	2.13	98.44	1.74	99.76	2.66	71.67	1.56
51	50771	90.74	4.59	96.03	5.17	89.69	5.05	68.89	5.35

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52	14547	106.29	4.22	114.87	4.36	107.02	4.24	82.79	4.75
53	27526	78.42	4.36	94.26	4.52	73.50	4.07	55.59	3.69
54	2705	114.51	4.67	126.26	3.03	121.86	3.17	98.44	3.37
55	24449	66.48	3.65	63.91	4.06	59.17	4.25	44.05	4.49
56	6340	117.42	3.04	125.49	2.61	114.05	3.85	85.93	4.18
57	7998	102.24	2.74	107.71	2.85	97.16	3.48	72.49	3.84
58	1491	94.46	2.39	107.55	2.88	104.11	2.70	83.95	3.14
59	4334	78.91	2.25	82.84	2.55	79.67	2.38	63.67	2.31
60	11216	57.52	3.84	52.36	3.91	47.47	3.63	34.56	3.71
61	4464	75.60	2.21	72.75	2.63	64.25	2.47	46.00	2.78
62	6931	87.49	3.57	89.06	2.92	79.34	2.74	56.92	2.45
63	16	94.00	1.89	118.75	1.69	116.62	1.87	99.06	2.84
64	389	79.19	1.76	87.93	1.73	85.81	1.69	71.32	2.07
65	2606	50.15	3.62	41.97	3.68	36.96	2.47	25.49	2.36
67	527	105.55	3.08	116.15	2.97	113.66	2.58	94.66	2.06
68	187	90.74	2.47	96.71	1.84	96.33	2.07	83.57	1.82
69	1329	108.87	2.53	110.37	2.73	96.89	2.31	70.33	2.17
70	1769	114.35	2.52	119.40	2.19	105.45	2.41	77.26	2.42
71	24	97.10	1.49	118.69	2.45	114.21	1.73	90.76	2.10
72	184	98.43	3.03	104.14	1.61	100.66	2.25	85.86	2.47
73	1376	95.70	1.80	101.93	1.80	95.18	2.21	73.75	2.25
74	742	75.47	3.51	77.10	2.70	69.52	2.62	47.71	1.84
75	1232	44.03	4.10	33.31	4.34	26.25	4.42	18.13	3.17
76	14	109.36	4.65	110.07	3.92	100.57	4.95	65.93	4.18
77	6587	125.86	4.13	136.88	4.01	127.94	4.01	100.34	4.56
78	1043	136.91	5.46	154.47	5.67	146.37	4.49	116.71	4.80
79	668	151.22	6.33	172.50	5.42	161.12	4.90	127.27	5.00
80	58	116.91	2.34	134.55	2.99	136.65	2.90	115.19	1.99
81	3018	138.35	4.34	146.63	3.45	134.87	3.70	103.61	3.50
82	182	162.58	6.82	187.45	4.42	171.95	5.85	134.75	7.69
83	76	100.93	2.42	128.61	1.37	121.07	2.53	94.29	2.63
84	2793	126.13	3.41	135.85	3.18	119.13	3.04	89.56	3.05
85	16	136.31	2.17	162.56	2.74	158.62	2.52	130.31	2.66
86	17	149.12	3.34	181.88	3.51	176.47	3.03	143.53	3.01
87	10	106.90	2.63	134.23	1.66	129.20	2.60	102.40	3.01
88	18	135.06	1.84	156.00	2.03	151.17	2.75	128.61	1.74
89	34	143.62	2.36	166.62	1.73	152.85	2.69	118.21	2.26
90	554	116.96	1.73	136.60	2.09	119.66	1.80	94.82	1.96
91	661	170.55	3.80	207.81	5.90	190.71	5.45	151.06	4.34
93	158	161.16	2.76	193.19	4.92	182.20	4.10	145.56	2.65
94	539	134.42	2.86	141.31	2.42	125.47	2.11	94.90	2.16

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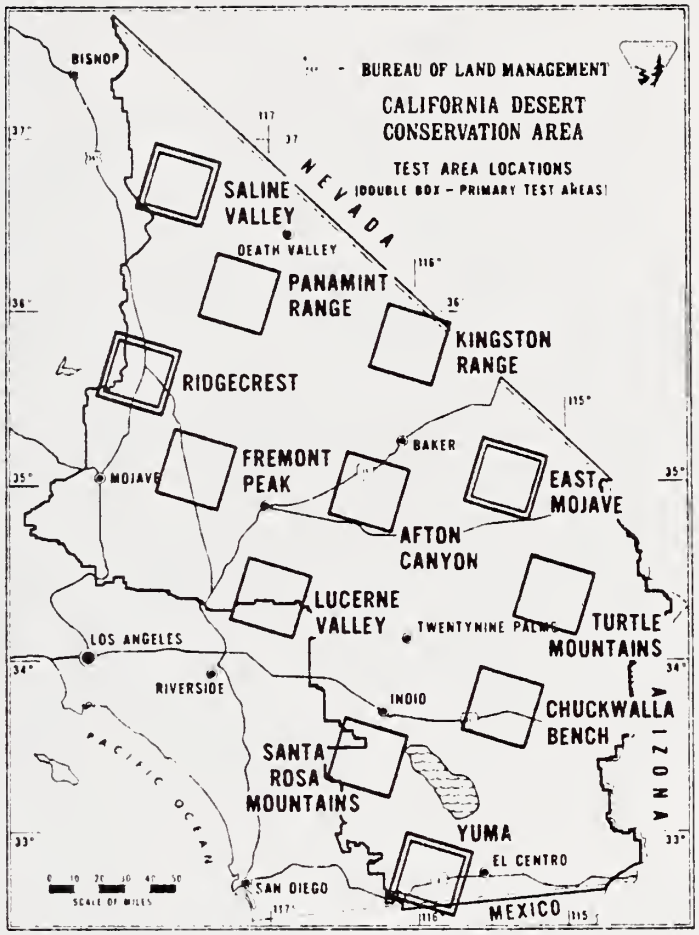
95	30	148.80	2.25	150.30	2.69	130.80	3.36	96.00	3.71
96	1401	149.94	3.98	162.53	4.27	147.23	4.78	113.27	4.74
97	6	153.17	2.67	187.83	2.34	177.33	1.38	137.67	2.06
98	143	153.17	3.66	172.14	2.74	155.36	1.46	119.33	2.05
99	13	175.38	0.92	206.62	3.65	186.69	2.64	147.15	3.03
	262144								

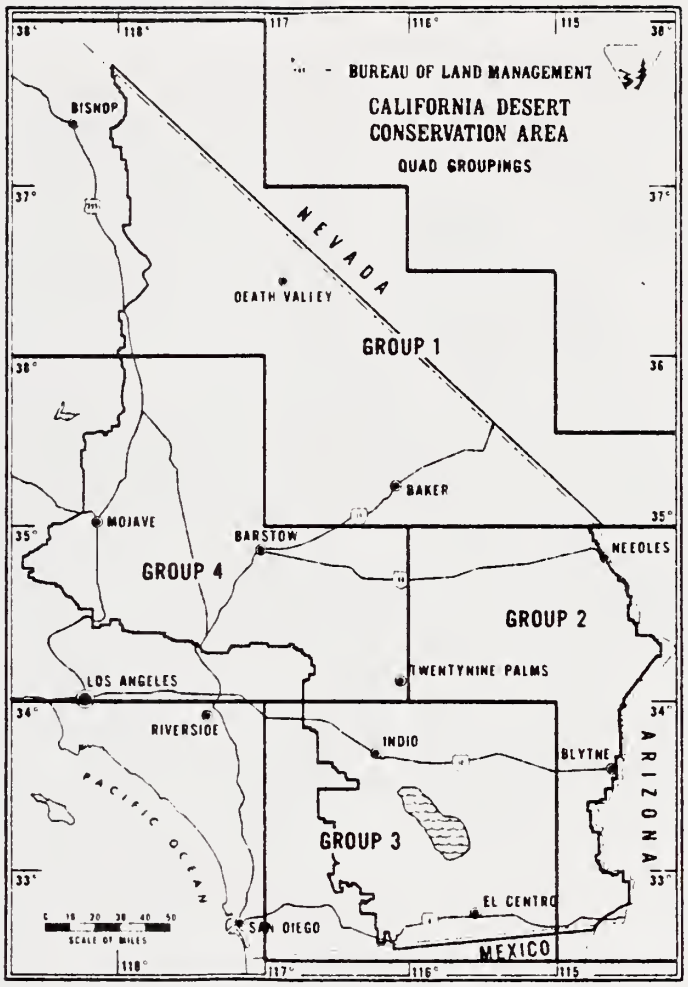


LOCATION OF TEST AREAS USED IN REFINING THE CLASSIFICATION STATISTICS.

-- Relative percent of pixels and clusters in the band ratio-brightness categories from the transect sample training set.

	LANDSAT BAND RATIO-BRIGHTNESS CATEGORIES			
	1	2	3	4
	Band 5 $\leq$ Band 6 Band 5 $\leq$ Band 7	Band 5 $\leq$ Band 6 Band 5 > Band 7	Band 5 > Band 6 Band 5 $\leq$ 130	Band 5 > Band 6 Band 5 > 130
Percent of Pixels	6%	12%	52%	30%
Percent of Clusters	18%	16%	35%	31%

THE VISIBLE TO INFRARED CLUSTER REDUCTION STRATEGY TABLE.



QUAD GROUPINGS USED IN REDUCING THE 100 ORIGINAL CLASSES TO 28 VEGETATION INFORMATION CLASSES

VEGETATION INFORMATION CLASSES

CLASS REDUCTION:
AN ACTUAL EXAMPLE
100 TO 28

LASS VII IS COMPOSED OF THE FOLLOWING ORIGINAL 100 CLASSES:

28
31
34 GENERALLY REPRESENTS
42 BLACK BRUSH AND SAGE BRUSH
51
68

OR EACH QUAD GROUP:

GROUP 1 NORTH MOJAVE	GROUP 2 E. MOJAVE/CO	GROUP 3 YUHA	GROUP 4 WEST MOJAVE
F CLASS VII ≤ 3000' T BECOMES CLASS XVI. IF CLASS II > 3000' IT EMAINS CLASS VII.	IF CLASS VII ≤ 500' IT BECOMES CLASS I. IF CLASS VII > 500' IT REMAINS AT CLASS VII.	IF CLASS VII ≤ 40' ELEVATION IT BE-COMES CLASS I. IF CLASS VII: 40' ≤ VII ≤ 3000' IT BE-COMES CLASS XXV. IF CLASS VII > 3000' IT REMAINS CLASS VII.	CLASS VII REMAINS CLASS VII ALL ELEVATION.

LANDSAT VEGETATION MAP

A generalized vegetation map presents a qualitative classification for the CDCA based on a multistage remote sensing procedure. Information used in making the map was obtained from 1) a variety of ground measurements, 2) quantitative large scale air photo interpretation and 3) Landsat digital data classification procedures. The nine map colors generally distinguish vegetational different structures and productivities. Differences in floristic composition within a color are further distinguished by the seven floristic zones as indicated by the map legend. All together 28 different "vegetation types" are represented. Biomass and production measurements were emphasized in the quantitative dimensions of the inventory because of the relevance they have to management decisions, especially in relation to livestock grazing. The quality and quantity of the production in terms of livestock forage is of particular importance in the considerations presented in the livestock grazing element. Biomass and production are positively correlated and in turn are closely related to the different moisture and temperature regimes of the desert.

The areas designated as forests (green on map) occur in the moister, cooler high elevations and exhibit the highest biomass [20 metric tones (MT)/ha] and highest production 2 MT/ha for the CDCA. The tree cover and stature in these areas is generally lower than that commonly thought of as representing true forests and are termed forests here merely for the purpose of trying to communicate the range of variability that exists in the CDCA.

The portions designated as high cover woodland are shown in blue. The area encompassed can be generally characterized by the presence of joshua trees and/or scattered pinyon and juniper (PJ) in the Mojave desert and PJ with ocotillo and agaves in the Colorado desert portions. Biomass averages around 10 MT/ha and production on the order of LMT/ha.

Woodlands with lower cover are shown in yellow. These areas have similar composition to the high cover woodlands but exhibit less (pinyon-juniper) and more creosote bush. Mojave yucca becomes locally important in the mid and east Mojave and in the Colorado desert portions. In the eastern Colorado desert, palo-verde-ironwood washes predominate. Biomass falls in the 4 to 5 MT/ha range while production is estimated to be 0.5 to 0.6 MT/ha.

High diversity scrub is shown in red. It is generally located in complex low mountain habitat, which in the extreme north includes sagebrush desert species, in the Mojave creosote, burrobush spiny hope sage, blackbrush etc and in the Colorado desert a preponderance of creosote, brittle bush and cactus. Biomass falls in the 2.5 to 4.5 MT/ha range while production is estimated from 0.3 to 0.6 MT/ha.

Moderate diversity scrub is shown in Orange. It is generally located on alluvial fans and is characterized by creosote bush with a few other perennial shrub species. Biomass ranges from 1.5 to 3.0 MT/ha and production from 0.2 to 0.4 MT/ha.

Low diversity scrub is shown in pink. It is made up of desert holly and honey sweet in the low elevation valleys of the Mojave and creosote bush and burrobush in the southern desert. Biomass falls in the range 1.0 to 2.5 MT/ha and production is estimated as averaging between 0.1 and 0.3 MT/ha.

Brown on the map represents a rather heterogeneous grouping of vegetations in passing from one part to another of the CDCA. It includes a Mojave saltbush scrub in the western Mojave, grass dominated sand sheets in the mid and eastern Mojave and sparcely vegetated paloverde-ironwood washes in the eastern Colorado desert. Biomass ranges from 1.5 to 3.0 MT/ha and production from 0.2 to 0.5 MT/ha.

White is generally barren or newly barren playas, dunes, sand sheets, etc. The biomass is less than 1.5 MT/ha and the production is less than 0.2 MT/ha.

Light green represents private agriculture lands under cultivation.

LOW LEVEL AERIAL TRANSECT INTERPRETATION

ROBIN KOBALY
BLM

INITIAL LOW LEVEL TRANSECT INTERPRETATION

- CONTRACT LET 1978
- INTERPRETATION OBTAINED NOT SUFFICIENTLY DETAILED
    - CONTRACTOR EXPERTISE IN BASIN AND RANGE
    - CONTRACTOR UNCLEAR ON CDCA PLANT DIVERSITY
- PROVIDE ROUGH BASE FOR A MORE IN DEPTH INTERPRETATION

PHOTO INTERPRETATION OF LOW LEVEL TRANSECTS

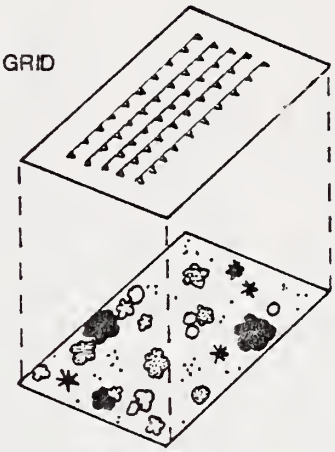
METHOD:

- LOCATE TRANSECT
- GATHER EXISTING INFORMATION
- SPECIES IDENTIFICATION BY LINE GRID SAMPLING
- ESTIMATE PLANT HEIGHT
- ESTIMATE % GROUND COVER
- TABULATE RESULTS

INFORMATION USED TO ASSIST AND VERIFY LOW LEVEL TRANSECT PHOTO INTERPRETATION

- GROUND CHECKING BY CONTRACTORS AND DESERT PLAN STAFF
- AERIAL PHOTOS WITH FIELD IDENTIFIED PLANT SPECIES
- ADDITIONAL GROUND TRANSECTS FROM PREVIOUS STUDIES

LOW - LEVEL PHOTO TRANSECT INTERPRETATION



EXISTING FLORISTIC INFORMATION FROM GROUND TRANSECTS

FIELD VERIFICATION OF SPECIES ON PHOTOS

PHOTOINTERPRET TRANSECT

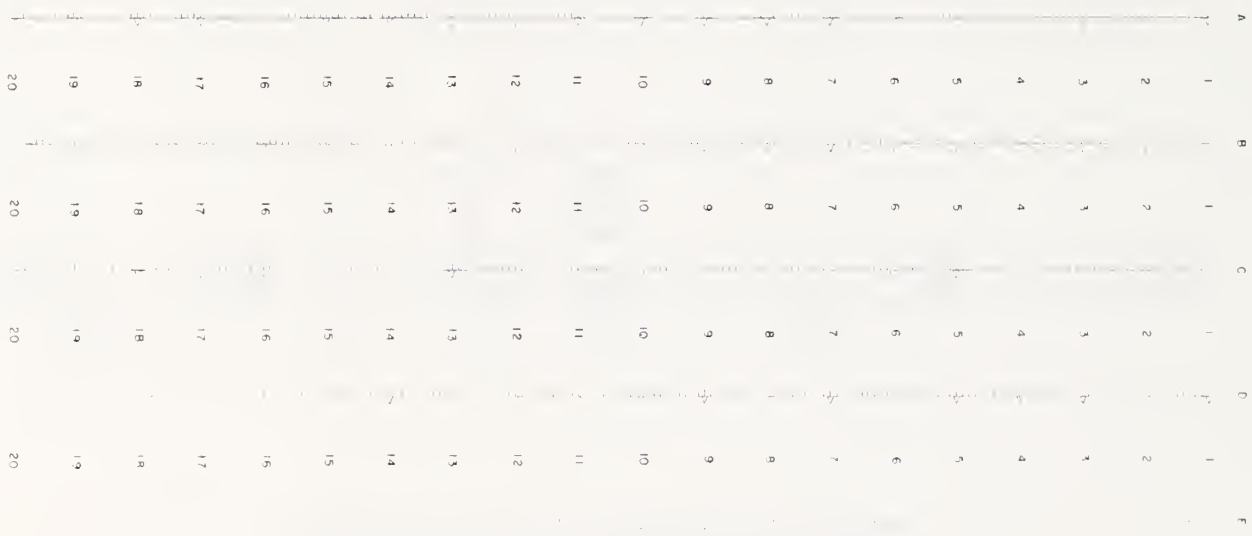
- Identify each plant hit by line grid
- Measure or estimate height of each plant hit
- Determine % ground cover of each plant species present

VOLUME : DENSITY VALUE ASSIGNED TO EACH PLANT SPECIES PRESENT

RELATIONSHIP BETWEEN VOLUME : DENSITY AND BIOMASS FOR EACH SPECIES PRESENT

DETERMINE BIOMASS OF TOTAL PLANT COVER FOR EACH SPECIES IN TRANSECT

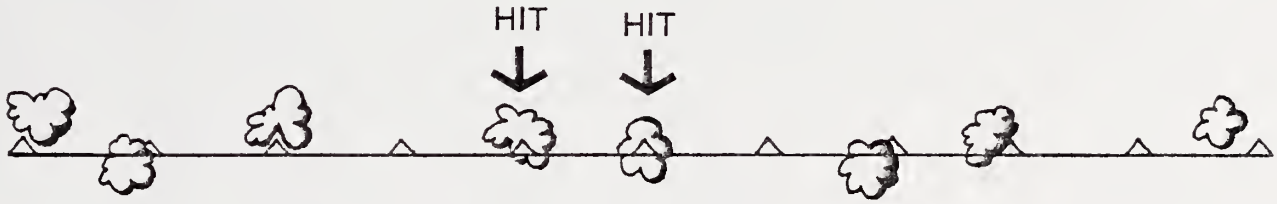
TRANSECT LINE GRID



Large Scale Photography Cover Composition Line Grid

TRANSECT LINE GRID

HITS AND MISSES



■ NOT A HIT IF MARKER TOUCHES

* SPACES BETWEEN BRANCHES

* SHADOW OF PLANT

GOLDFIELD WEST 1

TRANSECT = 500 POINTS TOTAL

Soil / Sand	Gravel 2mm - 8cm	Litter	Cobble 8 - 25cm	Stones / Boulders
109 54.4%			2 1%	22 11%

	SPECIES	STRUCT. CLASS	DOT COUNT	MOD. HT. EST.	P.U./P/B	%GRND. COVER	DENSITY KG/M	BIOMASS KG/HA	FORAGE BIOMASS KG/HA
1.	Hysa		8	0.6		1.6	1.54	150	<1
2.	Epne		5	0.6		1.0	4.29	262	24
3.	Grsp		32	0.5		6.4	4.28	1260	76
4.	Chna		4	0.9		0.8	3.49	251	1
5.	Atca		6	0.8		1.2	2.57	234	19
6.	Lyon		16	0.6		3.2	1.98	386	4
7.	Mesp		4	0.3		0.8	8.36	201	8
8.	Eula		1	0.5		0.2	3.90	36	4
9.	Stsp		5	0.3		1.0	2.92	88	31
10.	Haco		5	0.3		1.0	2.79	84	0
11.	Artr		12	0.8		2.4	1.80	328	<1
12.	Orhy		2	0.3		0.4	2.40	30	11
13.	Chte		1	0.6		0.2	3.3	40	0
14.	Erpu		2	0.1		0.4	1.46	9	3
15.						21%		3359	182
16.									
17.									
18.									
19.									
20.									

TRONA WEST 25

Soil / Sand	Gravel 2mm - 8cm	Litter	Cobble 8 - 25cm	Stones / Boulders
158 79%		⊠ 11 5.5%	1 0.5%	

	SPECIES	STRUCT. CLASS	DOT COUNT	MOD. HT. EST.	PUI/P/B	%GRND. COVER	DENSITY KG/M	BIOMASS KG/HA	FORAGE BIOMASS KG/HA
1.	Latr		⊠⊠ 20	1.07 m	0/.1	10.0	2.14	2290	0
2.	Amdu		⊏ 7	0.61 m	.02/.2	3.5	2.36	504	10
3.	Atpo		· 1	0.61 m	.04/.2	0.5	4.54	138	6
4.	Hysa		· · 2	0.76 m	.002/.2	1.0	1.54	117	<1
5.						15%		3049	16
6.									
7.									
8.									
9.									
10.									
11.									
12.									
13.									
14.									
15.									
16.									
17.									
18.									
19.									
20.									

ESTABLISHMENT OF THE PRODUCTION TO BIOMASS RELATIONSHIP

HYRUM JOHNSON

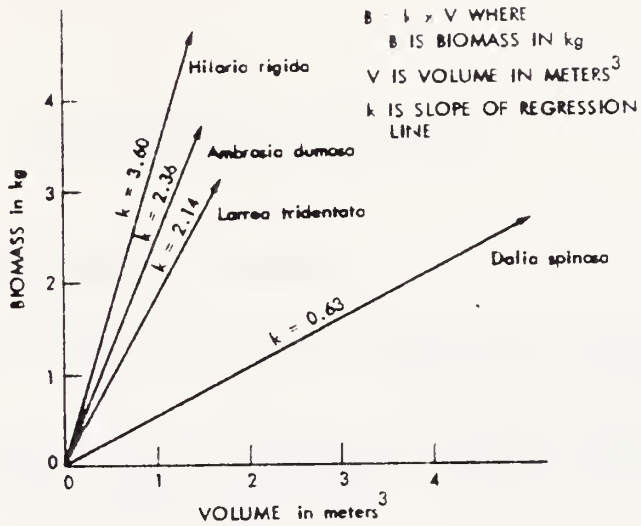
VEGETATION PRODUCTION

An understanding of the production/biomass relationship of desert vegetation is necessary if the vegetation is to be managed on a sustained yield basis. In stable natural desert ecosystems, the perennial plant biomass component remains more or less constant even though now biomass is being produced regularly. This requires a process or series of processes by which biomass disappears at the rate it is being produced. Some such processes are obvious, as is grazing by larger animals; others, involving invertibrate animals and microbes, are more subtle. Nevertheless it should be understood that if an ecosystem is to remain balanced the average annual increment of biomass production must be equaled by the same increment of biomass consumption i.e. on the average, consumption equals production. The amount of standing biomass that persists at any given time should be expected to fluctuate with environmental cycles i.e. season, drought etc.

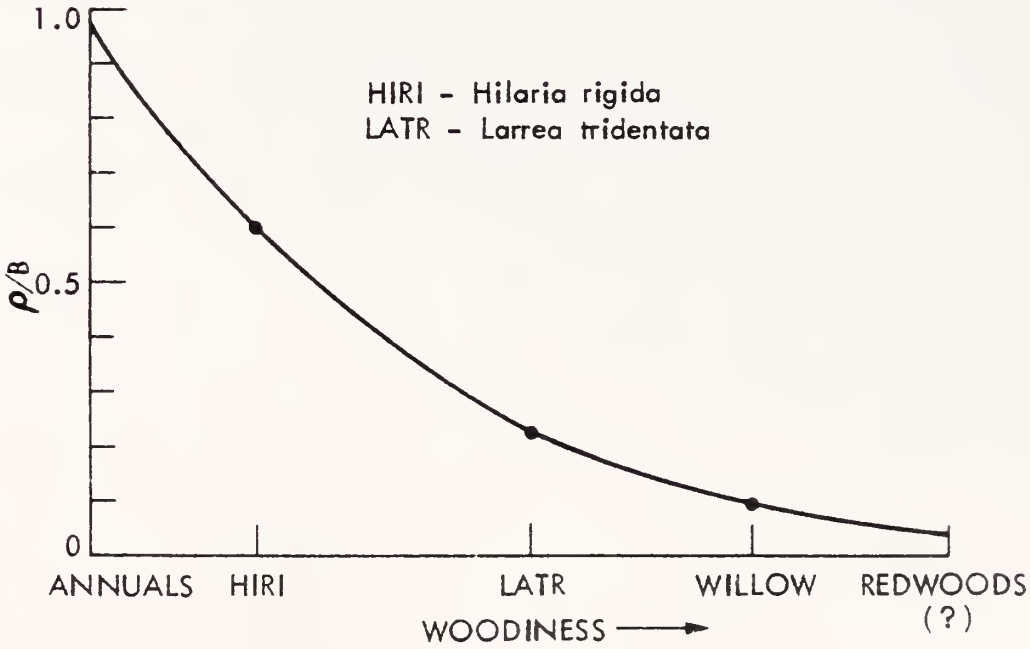
The relationship between production and biomass has relevance if the kind of consumption that takes place, whether it be by livestock, big game, non-game wildlife or whatever, is to be directed by management.

Approximately 14% of the perennial plant biomass of the CDCA is renewed each year as new production. That part of the production occurring on public lands judged suitable for livestock grazing is a point of focus for management recommendations dealing with the allocation of vegetation to livestock and other recognized users. Since only a part of the yearly plant production is suitable and/or available for livestock in a multiple use-sustained yield mode of operation it is informative to identify that portion in more detail. This portion has been termed "renewable livestock forage" here. It represents only that part of the production that: 1) is contributed by plant species considered palatable to livestock, 2) can be used (grazed) without adversely affecting the production capacity of the palatale species or the overall composition of the plant community in which they grow, 3) is produced on terrain suitable for livestock use (i.e. less than 50 percent slope and within 4 miles of livestock waters) and 4) occurs on lands producing above a specified minimum level (i.e. 25 lbs usable forage per acre).

AN EXAMPLE OF THE VOLUME TO BIOMASS RELATIONSHIP FOR SELECTED SPECIES.



AN EXAMPLE OF THE PRODUCTION TO BIOMASS RELATIONSHIP FOR SELECTED PLANT TYPES.



DETERMINATION OF BIOMASS

- GROUND MEASUREMENTS OBTAINED:
    - HEIGHT AND DIAMETER FOR INDICATOR PERENNIAL SPECIES
    - PERENNIAL SPECIES VOLUME TO WEIGHT RELATIONSHIP FOR EACH PLANT SPECIES
    - COMPARISON WITH LITERATURE
    - TABULATE

Volume Density Values
for Determinations of Production-Biomass Ratios and Forage Use Indices
of Important Desert Perennial Plant Species

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m^3)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
		SHRUBS AND TREES			
Acacia gregii Cat's claw	Acgr	0.8	0.1	<5	0.01
Acamptopappus shockleyi Shockley goldenhead	Acsh	2.79	0.2	10	0.1
Acamptopappus sphaerocephalus Goldenhead	Acsp	10.65	0.2	10	0.1
Agave deserti Desert agave	Agde	5.0 e	0.1	.0	0.0
Agave utahensis Utah agave	Agut	5.0 e	0.1	.0	0.0

[1]"e" = estimated value

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m^3)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Allenrolfea occidentalis Pickleweed	Aloc	1.5 e	0.4	0	0.0
Ambrosia dumosa Burrobush	Amdu	2.36	0.2	10	0.1
Artemisia nova Dwarf sagebrush	Arno	1.8 e	0.1	10	0.1
Artemisia spinescens Bud sagebrush	Arsp	4.01	0.2	20	0.2
Artemisia tridentata Great Basin sagebrush	Artr	1.8	0.1	<5	0.01
Atriplex canescens Four-winged saltbrush	Atca	2.57	0.2	40	0.4
Atriplex confertifolia Shadscale	Atco	6.39	0.2	10	0.1
Atriplex hymenelytra Desert holly	Athy	2.83	0.2	<5	0.01
Atriplex lentiformis Quailbrush	Atle	3.0 e	0.2	10	0.1

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m³)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Atriplex polycarpa Cattle spinach	Atpo	4.54	0.2	20	0.2
Atriplex spinifera Mojave saltbush	Atsp	6.4 e	0.2	10	0.1
Atriplex torreyi Torrey saltbush	Atto	5.0 e	0.2	20	0.2
Bebbia juncea Sweetbush	Beju	0.8 e	0.2	10	0.1
Beloperone californica Chuparosa	Beca	3.0 e	0.2	10	0.1
Brickellia arguta Spear-leaved brickellia	Brar	1.3 e	0.2	10	0.1
Brickellia incana Wooly brickellia	Brin	2.0 e	0.2	<5	0.01
Cassia armata Desert cassia	Caar	3.29	0.3	<5	0.01
Ceanothus greggii Desert ceanothus	Cegr	4.73	0.1	10	0.1
Cercidium floridum Palo verde	Cefl	1.0	0.1	0	0.0

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m³)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Cerocarpus intricatus Little-leaf Mountain mahogany	Cein	4.0 e	0.1	30	0.3
Cercocarpus ledifolius Curl-leaf Mountain mahogany	Cele	1.7 e	0.1	10	0.1
Chilopsis linearis Desert catalpa	Chli	0.5 e	0.1	0	0.0
Chrysothamnus nauseosus Rubber rabbit brush	Chna	3.49	0.2	<5	0.01
Chrysothamnus paniculatus Black-banded rabbit brush	Chpa	3.5 e	0.2	<5	0.01
Chrysothamnus teretifolius Round-leaved rabbit brush	Chte	3.3 e	0.2	<5	0.01
Chrysothamnus viscidiflorus Sticky-leaved rabbit brush	Chvi	3.3 e	0.2	<5	0.01
Coleogyne ramosissima Blackbrush	Cora	4.8 e	0.1	<5	0.01
Ceratoides lanata Winter fat	Cela	3.9	0.3	40	0.4

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m^3)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Cowania mexicana Cliff-rose	Come	4.8 e	0.1	40	0.4
Dalea fremontii Fremont indigo-brush	Dafr	2.47	0.1	10	0.1
Dalea polyadena Nevada indigo-brush	Dapo	3.0 e	0.1	10	0.1
Dalea spinosa Smoke tree	Dasp	0.63	0.1	0	0.0
Echinocereus engelmanii Calico cactus	Ecen	10.0 e	0.1	0	0.0
Encelia farinosa Brittlebush	Enfa	0.91	0.2	<5	0.01
Encelia frutescens Rayless encelia	Enfr	1.0 e	0.2	<5	0.01
Encelia virginensis Acton encelia	Envi	1.1	0.2	<5	0.01
Ephedra californica California joint fir	Epca	5.5 e	0.3	10	0.1
Ephedra funerea Death Valley joint fir	Epfu	2.2	0.3	20	0.2

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m^3)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Ephedra nevadensis Nevada joint fir	Epne	4.29	0.3	30	0.3
Ephedra viridus Mountain joint fir	Epvi	5.47	0.3	20	0.2
Eriogonum fasciculatum California buckwheat	Erfa	2.53	0.3	20	0.2
Eriogonum wrightii Wright buckwheat	Erwr	3.0 e	0.3	40	0.4
Fallugia paradoxa Apache-plume	Fapa	4.0 e	0.1	10	0.1
Ferocactus acanthodes Barrel cactus	Feac	107.3	0.1	0	0.0
Fouquieria splendens Ocotillo	Fosp	6.13	0.1	<5	0.01
Garrya flavescens Yellow-leaf silk tassel	Gafl	4.7 e	0.1	20	0.2
Grayia spinosa Spiny hop-sage	Grsp	4.28	0.2	30	0.3
Gutierrezia californica California snakeweed	Guca	2.1 e	0.3	0	0.0
Gutierrezia microcephala Small-headed matchweed	Gumi	2.11	0.3	0	0.0

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m³)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Haplopappus cooperi Cooper goldenbush	Haco	2.79	0.2	0	0.0
Haplopappus linearifolius Linear-leaved goldenbush	Hali	2.44	0.2	<5	0.01
Hymenoclea salsola Cheesebush	Hysa	1.54	0.2	<5	0.01
Hyptis emoryi Desert lavender	Hyem	1.3 e	0.2	10	0.1
Isomeris arborea Bladder-pod	Isar	3.5 e	0.3	10	0.1
Juniperus californica California juniper	Juca	3.4 e	0.1	0	0.0
Juniperus occidentalis Western juniper	Juoc	3.4 e	0.1	0	0.0
Juniperus osteosperma Utah juniper	Juos	3.36	0.1	0	0.0
Kochia americana Red molly	Koam	3.1	0.6	<5	0.01
Krameria grayii White ratany	Krgr	0.55	0.5	10	0.1
Krameria parvifolia Little-leaved ratany	Krpa	0.98	0.5	10	0.1
Larrea tridentata Creosote bush	Latr	2.14	0.1	0	0.0

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m^3)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Lepidium fremontii Desert alyssum	Lefr	3.23	0.2	<5	0.01
Lepidospartum squamatum Scale-broom	Lesq	3.0 e	0.2	<5	0.01
Lotus rigidus Desert rock-pea	Lori	2.0 e	0.2	<5	0.01
Lycium andersonii Anderson thornbush	Lyan	1.98	0.1	10	0.1
Lycium brevipes Frutilla, desert-thorn	Lybr	12.98	0.1	10	0.1
Lycium cooperi Peach-thorn	Lyco	2.0 e	0.1	10	0.1
Lycium pallidum Rabbit-thorn	Lypa	0.79	0.1	10	0.1
Machaeranthera tortifolia Desert aster	Mato	1.61	0.2	20	0.2
Menodora spinescens Spiny menodora	Mesp	8.36	0.2	20	0.2
Nolina bigelovii Bigelow nolina	Nobi	17.0 e	0.1	0	0.0
Nolina parryi Parry nolina	Nopa	17.0 e	0.1	0	0.0
Olneya tesota Desert ironwood	Olte	1.76	0.1	<5	0.01
Opuntia acanthocarpa Deer-horn cholla	Opac	1.10	0.1	0	0.0

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m^3)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Opuntia basilaris Beavertail cactus	Opba	11.7 e	0.1	0	0.0
Opuntia bigelovii Teddy-bear cholla	Opbi	10.2	0.1	0	0.0
Opuntia echinocarpa Silver cholla	Opec	1.1 e	0.1	0	0.0
Opuntia phaeacantha Desert prickley-pear	Opph	11.7	0.1	0	0.0
Opuntia ramosissima Pencil cholla	Opra	1.1 e	0.1	0	0.0
Petalonyx thurberi Thurber sandpaper plant	Peth	3.3 e	0.3	0	0.0
Peucephyllum schottii Pygmy cedar, desert fir	Pesc	3.0 e	0.1	0	0.0
Pinus monophylla Pinyon pine, single-leaf pinyon	Pimo	2.47	0.1	0	0.0
Prosopis glandulosa Honey mesquite	Prgl	0.81	0.1	<5	0.01
Prosopis pubescens Screw bean mesquite	Prpu	0.8 e	0.1	<5	0.01
Prunus fasciculata Desert almond	Prfa	3.45	0.1	<5	0.01
Purshia glandulosa Antelope-brush	Pugl	4.8 e	0.1	40	0.4

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m^3)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Quercus chrysolepis Canyon live oak	Quch	4.5 e	0.1	<5	0.01
Quercus dumosa Scrub oak	Qudu	4.5 e	0.1	<5	0.01
Ribes velutinum Plateau gooseberry	Ri e	1.0 e	0.2	<5	0.01
Salacornia utahensis Glasswort	Saut	1.5 e	0.4	0	0.0
Salazaria mexicana Paper-bag bush	Same	0.9	0.3	10	0.1
Salix exigua Slender willow	Saex	1.0 e	0.2	10	0.1
Salvia dorrii Great Basin blue sage	Sado	3.0 e	0.2	10	0.1
Salvia mohavensis Mojave sage	Samo	3.0 e	0.2	10	0.1
Sarcobatus vermiculatus Greasewood	Sa e	4.0 e	0.1	0	0.0
Stephanomeria pauciflora Desert straw	Stpa	0.8 e	0.4	30	0.3
Suaeda torreyana Inkweed	Suto	0.75	0.4	0	0.0

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

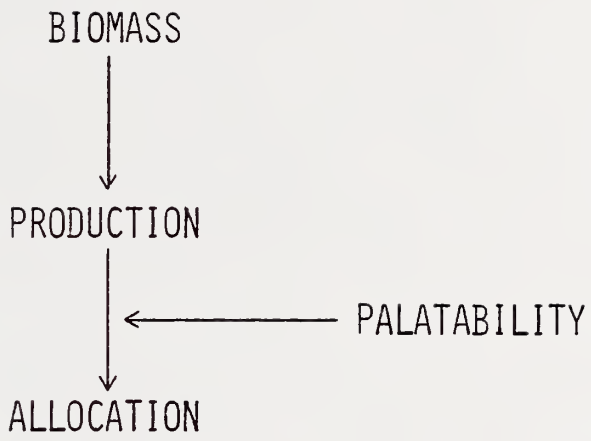
SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m³)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Tetradymia glabrata Bald-leaved felt-thorn	Tegl	2.7	0.2	0	0.0
Tetradymia spinosa var. longispina Cotton-thorn	Tesp	3.19	0.1	0	0.0
Thammosma montana Turpentine broom	Thmo	2.99	0.2	0	0.0
Trixis californica California trixis	Trca	1.0 e	0.2	10	0.1
Viguiera deltoidea var. parishii Parish viguiera	Vide	1.0 e	0.2	<5	0.01
Yucca baccata Fleshy-fruited yucca	Yuba	4.88	0.1	<5	0.01
Yucca brevifolia Joshua tree	Yubr	6.65	0.1	<5	0.01
Yucca schidigera Mohave yucca	Yusc	16.94	0.1	<5	0.01
		FORBS			
Mirabilis bigelovii Wishbone bush	Mibi	0.4e	0.6	40	0.4
Sphaeralcea ambigua Desert mallow	Spam	0.41	0.6	40	0.4
Tidestromia oblongifolia Honey-sweet	Tiob	2.0 e	0.6	<5	0.01

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m^3)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
		GRASSES			
Aristida spp. Triple-awned grass	Ar__	2.9 e	0.7	20	0.2
Bouteloua curtipendula Side-oats grama	Bocu	1.9 e	0.7	50	0.5
Bouteloua eriopoda Black grama	Boer	1.9 e	0.7	50	0.5
Bouteloua gracilis Blue grama	Bogr	1.9 e	0.7	50	0.5
Distichlis spicata Saltgrass	Disp	1.82	0.7	30	0.3
Erioneuron pulchellum Fluffgrass	Erpu	1.5 e	0.7	20	0.2
Hilaria jamesii Galleta grass	Hija	5.21	0.7	50	0.5
Hilaria rigida Big Galleta grass	Hiri	3.60	0.7	40	0.4
Muhlenbergia microsperma Littleseed muhly	Mumi	2.5 e	0.7	50	0.5
Muhlenbergia porteri Bush muhly	Mupo	1.92	0.7	50	0.5
Oryzopsis hymenoides Indian rice grass	Orhy	2.49	0.7	50	0.5
Poa scabrella Pine bluegrass	Posc	1.1 e	0.7	50	0.5
Sitanion hystrix					

CDCA SPECIES AND FORAGE IMPORTANCE INDEX

SPECIES NAME Common Name	Species Code	Volume Density[1] (kg/m^3)	Ratio of Production Biomass	Proper Use Factor (P.U.F.)	Forage Importance Index (FII)
Squirrel-tail	Sihy	1.1 e	0.7	40	0.4
Sporobolus airoides Alkali sacaton	Spai	6.12	0.7	40	0.4
Stipa speciosa Desert needlegrass	Stsp	2.92	0.7	50	0.5
Tridens muticus Slim tridens	Trmu	1.46	0.7	40	0.4


BIOMASS
PRODUCTION
PALATABILITY
ALLOCATION

DEFINITIONS:

TOTAL STANDING BIOMASS - THE AMOUNT OF BIOMASS IN KILOGRAMS PRESENT

TOTAL PRODUCTION - THE AMOUNT OF BIOMASS PRODUCED EACH YEAR IN KILOGRAMS

TOTAL FORAGE PRODUCTION - THE AMOUNT OF BIOMASS PRODUCED EACH YEAR IN KILOGRAMS THAT IS ACTUALLY EDIBLE

RENEWABLE FORAGE PRODUCTION - THE AMOUNT OF BIOMASS PRODUCED EACH YEAR IN KILOGRAMS THAT IS EDIBLE YET PROVIDES THE PLANT A SUSTAINED YIELD BASE SO THAT IT CAN CONTINUE TO GROW

PROPER USE FACTOR (PUF) - THE HEALTHY AMOUNT OF FORAGE THAT CAN BE EATEN YET ALLOW THE PLANT TO CONTINUE TO GROW IN A YIELDING BASIS. (TOTAL FORAGE PRODUCTION X PUF = RENEWABLE FORAGE PRODUCTION).

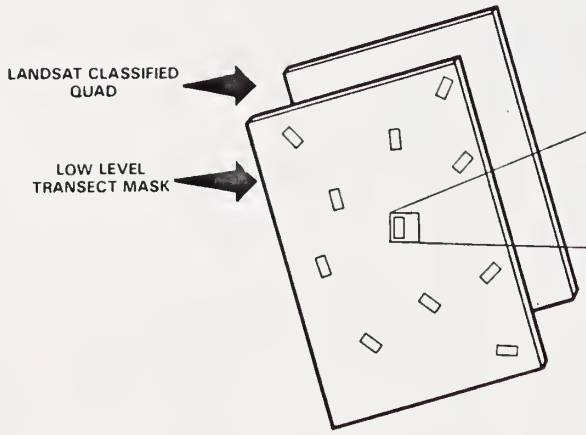
MERGING OF THE CLASSIFICATION WITH THE LOW LEVEL AERIAL TRANSECT PHOTOS

RON MCLEOD

MERGING OF CLASSIFICATION WITH LOW LEVEL
AERIAL TRANSECT PHOTOS

- BACK CLASSIFICATION
- RESOURCE INFORMATION EXTRACTION

RESOURCE INFORMATION EXTRACTION



CLASSIFICATION VALUES IN TRANSECT

0	0	0	0	0	0	0	0	0
0	14	14	14	15	15	0	0	0
0	1A	14	14	1A	15	0	0	0
0	14	14	14	14	15	0	0	0
0	14	14	14	14	15	0	0	0
0	14	13	14	14	14	0	0	0
0	14	8	14	14	15	0	0	0
0	0	7	14	14	14	0	0	0
0	0	0	0	0	0	0	0	0

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

BIOMASS ESTIMATION
SPECTRAL CLASS VALUES TABULATED BY TRANSECT

QUAD	QUAD ID	TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	CALC AREA	PAINT REGION	CENTROID LINE	CENTROID SAMPLE
TRONAW	20	C12	13	1	33 50	38	1218	1084
TRONAW	20	C12	1A	1	33 50	38	1218	1084
				35				
TRONAW	20	C13	17	1	24 00	35	1150	1231
TRONAW	20	C13	1A	11	24 00	35	1150	1231
TRONAW	20	C13	15	10	24 00	35	1180	1231
				22				
TRONAW	20	C1A	8	1	20 00	39	1278	1331
TRONAW	20	C14	15	2	20 00	39	1278	1331
TRONAW	20	C14	17	15	20 00	38	1228	1331
				18				
TRONAW	20	C15	8	14	27 00	32	1127	1308
TRONAW	20	C16	1A	7	27 00	32	1127	1308
TRONAW	20	C15	18	3	27 00	32	1127	1308
				24				
TRONAW	20	C16	17	11	26 50	33	1141	583
TRONAW	20	C16	18	18	26 50	33	1141	883
				28				
TRONAW	20	C15	1A	12	26 50	30	1084	881
TRONAW	20	C16	15	14	28 50	30	1084	881
				28				
TRONAW	20	C20	8	1	27 00	36	1172	788
TRONAW	20	C20	11	13	27 00	38	1172	788
TRONAW	20	C20	12	8	27 00	36	1172	788
TRONAW	20	C20	1A	1	27 00	36	1172	789
TRONAW	20	C20	15	1	27 00	38	1172	789
				25				
TRONAW	20	C21	16	6	27 00	37	1188	880
TRONAW	20	C21	18	16	27 00	37	1188	880
TRONAW	20	C21	18	1	27 00	27	1188	880
				22				

TABULAR LISTING

EDIT TRANSECTS

LOW LEVEL AERIAL PHOTOGRAPHS FOR TRANSECTS

PHOTO INTERPRETATION

BIOMASS AND SOILS INFORMATION

CORRELATE WITH SPECTRAL CLASSES

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA
TRONAW 1 DEGREE BY 1 DEGREE QUADRANGLE

BIOMASS STATISTICS BY SPECTRAL CLASS
WEIGHTED
KILOGRAMS PER HECTARE

QUAD ID	SPECTRAL CLASS	PIXELS PER CLASS	STANDING BIOMASS	FORAGE PRODUCTION
20	7	30	770 A3	18 06
20	8	21	682 35	1 70
20	9	24	660 17	18 14
20	10	80	97A 20	20 83
20	11	248	1376 80	23.23
20	12	141	1878 20	21 98
20	13	8	85 05	1 02
20	1A	230	1315 01	27 12
20	15	138	1690 86	32 37
20	16	56	1652 83	22 08
20	17	189	248A 39	60 34
20	18	8A	7607 02	A2 A8
20	19	12	1318 88	28 15
		1239		

TABULAR REPORT

KINGMAN WEST QUADRANGLE TRANSECT C32 LINE=981 SAMPLE=837

SAR

LINE \ SAMP	1		3		5		7		9		11		13		15		17		19		21		23		25		27		29	
1	15	15	15	15	15	15	15	15	15	15	15	15	17	15	15	15	17	17	16	18	16	18	18	18	9	16	9	18	18	16
2	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	17	17	17	16	16	18	18	18	17	18	16	18	16	16	16
3	15	15	15	15	15	15	15	15	15	15	15	15	17	9	17	17	17	17	16	9	18	18	18	17	9	9	16	18	16	9
4	15	15	15	15	15	15	15	15	15	15	17	15	17	15	17	17	17	15	17	16	9	18	16	17	18	16	16	18	16	16
5	15	15	15	15	15	15	15	15	15	15	15	15	17	15	17	17	17	16	16	18	16	16	18	18	16	16	18	18	16	16
6	15	15	15	15	15	15	15	15	15	17	15	17	17	17	17	17	17	16	17	16	17	16	16	16	16	18	18	18	16	17
7	17	15	15	15	15	15	15	15	15	15	17	15	17	17	17	17	16	16	18	17	17	17	18	18	18	18	18	9	9	17
8	15	15	15	15	15	15	15	14	15	15	15	17	17	17	17	17	17	16	18	17	17	17	18	18	18	18	18	16	16	17
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11	17	15	15	15	15	15	15	8	15	17	17	16	17	17	16	16	18	15	16	18	16	18	18	16	16	16	16	17	17	17
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16	15	15	15	15	15	17	17	16	16	16	17	16	17	17	16	9	13	13	16	16	18	18	16	16	16	16	17	17	17	17
17	15	15	15	15	15	17	17	17	17	16	16	17	17	16	16	16	16	13	18	18	18	16	16	16	16	16	17	17	17	17
18	15	15	15	15	15	17	17	16	17	17	16	16	17	16	16	16	18	15	18	18	18	16	17	16	16	17	17	17	17	17
19	15	15	15	15	17	17	16	16	17	17	16	16	9	16	17	16	18	13	18	18	18	16	16	17	17	17	17	17	17	17
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22	15	17	17	9	17	17	16	16	16	16	16	16	16	16	16	18	18	18	16	16	16	16	17	17	17	17	17	17	15	17
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24	15	17	17	16	16	16	16	17	16	16	16	16	16	18	18	18	16	16	16	16	16	16	17	17	17	17	17	17	17	17
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27	17	17	16	16	16	16	16	17	17	16	16	18	18	16	16	16	17	17	16	17	17	17	17	17	17	17	15	15	15	17
28	17	16	16	16	16	16	16	16	16	16	16	18	18	16	16	17	17	17	17	17	17	17	17	17	17	17	15	17	17	17
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30	16	16	16	16	16	16	17	17	16	18	18	16	16	17	17	17	17	17	17	17	17	17	17	17	17	17	15	15	17	17	17

KINGMAN WEST TRANSECT 32

KINGMAN WEST QUADRANGLE TRANSECT C32 LINE=981 SAMPLE=837

SAR

LINE \ SAMP	1		3		5		7		9		11		13		15		17		19		21		23		25		27		29	
1	15	15	15	15	15	15	15	15	15	15	15	15	17	15	15	15	17	17	16	18	16	18	18	18	9	16	9	18	18	16
2	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	17	17	17	16	16	18	18	18	17	18	16	18	16	16	16
3	15	15	15	15	15	15	15	15	15	15	15	15	17	9	17	17	17	17	16	9	18	18	18	17	9	9	16	18	16	9
4	15	15	15	15	15	15	15	15	15	15	17	15	17	15	17	17	17	15	17	16	9	18	16	17	18	16	16	18	16	16
5	15	15	15	15	15	15	15	15	15	15	15	15	17	15	17	17	17	16	16	18	16	16	18	18	16	16	18	18	16	16
6	15	15	15	15	15	15	15	15	15	17	15	17	17	17	17	17	17	16	17	16	17	16	16	16	16	18	18	18	16	17
7	17	15	15	15	15	15	15	15	15	15	17	15	17	17	17	17	16	16	18	17	17	17	18	18	18	18	18	9	9	17
8	15	15	15	15	15	15	15	14	15	15	15	17	17	17	17	17	17	16	18	17	17	17	18	18	18	18	18	16	16	17
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11	17	15	15	15	15	15	15	8	15	17	17	16	17	17	16	16	18	16	16	18	16	18	18	16	16	16	16	17	17	17
12	15	15	15	15	15	17	15	15	17	17	17	17	17	255	17	16	16	16	18	18	18	18	16	17	16	16	16	17	17	17
13	17	15	8	15	15	15	15	17	17	17	17	17	255	17	255	17	16	16	18	18	18	18	16	17	16	16	16	17	17	17
14	15	15	15	15	15	17	17	17	17	17	17	16	255	17	17	255	255	16	18	18	18	16	16	16	17	17	17	17	17	17
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16	15	15	15	15	15	17	17	16	16	16	17	16	255	17	16	9	18	18	255	16	18	18	16	16	16	16	17	17	17	17
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19	15	15	15	15	17	17	16	16	17	17	17	16	9	16	17	16	255	13	18	18	255	16	17	17	17	17	17	17	17	17
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21	15	15	17	17	17	17	16	16	16	16	16	16	16	16	16	18	18	18	16	255	16	16	17	17	17	17	17	17	17	17
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30	16	16	16	16	16	16	17	17	16	18	18	16	16	17	17	17	17	17	17	17	17	17	17	17	17	17	15	15	17	17	17

KINGMAN WEST TRANSECT 32

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

28 CLASS TRANSECTS

QUAD	QUAD ID	TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	CALC AREA	PAINT REGION	CENTROID LINE	CENTROID SAMPLE
				37				
KINGMW	12	C29	8	15	31.00	32	1013	661
KINGMW	12	C29	9	9	31.00	32	1013	661
KINGMW	12	C29	15	10	31.00	32	1013	661
				34				
KINGMW	12	C30	8	8	39.00	34	1035	680
KINGMW	12	C30	9	5	39.00	34	1035	680
KINGMW	12	C30	12	11	39.00	34	1035	680
KINGMW	12	C30	14	1	39.00	34	1035	680
KINGMW	12	C30	15	12	39.00	34	1035	680
				37				
KINGMW	12	C31	7	2	45.00	28	941	758
KINGMW	12	C31	10	4	45.00	28	941	758
KINGMW	12	C31	11	25	45.00	28	941	758
KINGMW	12	C31	12	2	45.00	28	941	758
KINGMW	12	C31	13	1	45.00	28	941	758
KINGMW	12	C31	14	9	45.00	28	941	758
				43				
KINGMW	12	C32	9	1	36.00	30	981	837
KINGMW	12	C32	16	9	36.00	30	981	837
KINGMW	12	C32	17	8	36.00	30	981	837
KINGMW	12	C32	18	15	36.00	30	981	837
				33				
KINGMW	12	C33	6	1	48.00	26	924	1077
KINGMW	12	C33	7	41	48.00	26	924	1077
KINGMW	12	C33	8	4	48.00	26	924	1077
KINGMW	12	C33	10	1	48.00	26	924	1077
				47				
KINGMW	12	C34	10	18	45.50	40	1108	204
KINGMW	12	C34	11	18	45.50	40	1108	204
KINGMW	12	C34	13	5	45.50	40	1108	204
KINGMW	12	C34	14	3	45.50	40	1108	204
KINGMW	12	C34	26	1	45.50	40	1108	204

TABULATION OF THE 28 SPECTRAL VEGETATION CLASSES BY TRANSECT

KINGMAN WEST TRANSECT 32

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

100 CLASS TRANSECTS

QUAD	QUAD ID	TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	CALC AREA	PAINT REGION	CENTROID LINE	CENTROID SAMPLE
KINGMW	12	C29	54	9	31.00	32	1013	661
KINGMW	12	C29	63	9	31.00	32	1013	661
KINGMW	12	C29	67	1	31.00	32	1013	661
				34				
KINGMW	12	C30	27	7	39.00	34	1035	680
KINGMW	12	C30	29	1	39.00	34	1035	680
KINGMW	12	C30	52	1	39.00	34	1035	680
KINGMW	12	C30	54	4	39.00	34	1035	680
KINGMW	12	C30	58	11	39.00	34	1035	680
KINGMW	12	C30	63	5	39.00	34	1035	680
KINGMW	12	C30	67	8	39.00	34	1035	680
				37				
KINGMW	12	C31	26	2	45.00	28	941	758
KINGMW	12	C31	51	25	45.00	28	941	758
KINGMW	12	C31	52	2	45.00	28	941	758
KINGMW	12	C31	53	4	45.00	28	941	758
KINGMW	12	C31	57	7	45.00	28	941	758
KINGMW	12	C31	59	2	45.00	28	941	758
KINGMW	12	C31	61	1	45.00	28	941	758
				43				
KINGMW	12	C32	36	1	36.00	30	981	837
KINGMW	12	C32	77	8	36.00	30	981	837
KINGMW	12	C32	78	15	36.00	30	981	837
KINGMW	12	C32	80	8	36.00	30	981	837
KINGMW	12	C32	88	1	36.00	30	981	837
				33				
KINGMW	12	C33	26	26	48.00	26	924	1077
KINGMW	12	C33	27	3	48.00	26	924	1077
KINGMW	12	C33	28	7	48.00	26	924	1077
KINGMW	12	C33	30	3	48.00	26	924	1077
KINGMW	12	C33	34	1	48.00	26	924	1077
KINGMW	12	C33	38	5	48.00	26	924	1077
KINGMW	12	C33	43	1	48.00	26	924	1077
KINGMW	12	C33	53	1	48.00	26	924	1077
				47				
KINGMW	12	C34	49	1	45.50	40	1108	204
KINGMW	12	C34	51	16	45.50	40	1108	204

TABULATION OF THE ORIGINAL 100
SPECTRAL CLASSES BY TRANSECT

LANDSAT PHOTO TRANSECT SUMMARY

	NON-FORAGE CLASSES			FORAGE CLASSES																						
TRANSECT	P/B = .1 0	P/B = .2	P/B = .3	P/B = .1 .001	P/B = .2 .002	P/B = .3 .003	P/B = .1 .01	P/B = .2 .02	P/B = 0.1 .03	P/B = 0.2 .03	P/B = .01 .04	P/B = .02 .04	P/B = .5 .05	P/B = 0.2 .06	P/B = 0.3 .06	P/B = .2 .08	P/B = .3 .09	P/B = .3 0.12	P/B = .7 0.14	P/B = .7 0.21	P/B = .6 0.24	P/B = .7 0.28	P/B = .7 0.35	Forage Production	Total Biomass
TW 2	3132	3132						360				620												32	4112
TW 7	4125	4125					301	1420				1226		385				234						132	7691
TW 8	3860	3860						1917				2077												121	7354
TW 10								4446															Present	89	4446
TW 11	1461	1461					Present	319				692			38									29	2818
TW 12	1138	1138					Present	106				361												6	1605
TW 13	2290	2290						142						385		314							175	112	2306
TW 14	2028	2028			47									2756		540	386							269	5527
TW 15	1461	1461																					Present	Present	1461
TW 18	1378	1378					105	1155						339									57	64	3034
TW 19	783	783						2390				1033		652										128	4358
TW 20	1946	1946			117			460				Present		389										33	2912
TW 21	2277	2277						1860																38	4137
TW 22	552	467	85		21			1145																22	1718
TW 23	121	121						71				690		783				952					17	196	2634
TW 25	2290	2290			117			504				138												16	3049
TW 26		-						779				5539												222	5539
TW 27	3264	3264						389															Present	16	4043
TW 28	1174	1174			641		Present	1080				2588		98										118	4890
TW 29	309	309			47		196	391						197	58									39	1837
TW 30	2716	1964	770		94		242	212		14				522	29		296	119						84	4423
TW 32	1530	1145	385		188		152					690		197	175									86	3382

BUREAU OF LAND MANAGMENT
CALIFORNIA DESERT CONSERVATION AREA
1 DEGREE BY 1 DEGREE QUADRANGLE

BIOMASS STATISTICS FOR LOW ALTITUDE TRANSECTS
DATA INPUT FROM PRODUCTION USE INDEX TABLE

TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PERCENT GROUND COVER	TOTAL STANDING BIOMASS	PRODUCTION TO BIOMASS CLASSES CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	CLASS 8	CLASS 9	CLASS 10	CLASS 11
		26													
C20	8	1	17.0	2912	1946	0	117	0	0	460	0	0	0	0	0
C20	11	13	17.0	2912	1946	0	117	0	0	460	0	0	0	0	0
C20	12	9	17.0	2912	1946	0	117	0	0	460	0	0	0	0	0
C20	14	1	17.0	2912	1946	0	117	0	0	460	0	0	0	0	0
C20	15	1	17.0	2912	1946	0	117	0	0	460	0	0	0	0	0
		25													
C21	16	6	14.0	4137	2277	0	0	0	0	1860	0	0	0	0	0
C21	18	15	14.0	4137	2277	0	0	0	0	1860	0	0	0	0	0
C21	19	1	14.0	4137	2277	0	0	0	0	1860	0	0	0	0	0
		22													
C22	7	1	6.0	1718	552	0	21	0	0	1145	0	0	0	0	0
C22	10	1	6.0	1718	552	0	21	0	0	1145	0	0	0	0	0
C22	11	21	6.0	1718	552	0	21	0	0	1145	0	0	0	0	0
C22	13	1	6.0	1718	552	0	21	0	0	1145	0	0	0	0	0
		24													
C23	15	1	11.0	2634	121	0	0	0	0	71	0	0	0	690	0
C23	17	22	11.0	2634	121	0	0	0	0	71	0	0	0	690	0
		23													
C25	14	3	15.0	3049	2290	0	117	0	0	504	0	0	0	138	0
C25	15	1	15.0	3049	2290	0	117	0	0	504	0	0	0	138	0
C25	17	20	15.0	3049	2290	0	117	0	0	504	0	0	0	138	0
		24													
C26	14	22	20.0	5539	0	0	0	0	0	0	0	0	0	5539	0
C26	15	7	20.0	5539	0	0	0	0	0	0	0	0	0	5539	0
		29													
C27	9	1	23.0	4043	3264	0	0	0	0	779	0	0	0	0	0
C27	16	16	23.0	4043	3264	0	0	0	0	779	0	0	0	0	0
C27	17	5	23.0	4043	3264	0	0	0	0	779	0	0	0	0	0

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA
1 DEGREE BY 1 DEGREE QUADRANGLE

BIOMASS STATISTICS FOR LOW ALTITUDE TRANSECTS
DATA INPUT FROM PRODUCTION USE INDEX TABLE

TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PERCENT GROUND COVER	TOTAL STANDING BIOMASS	PRODUCTION TO BIOMASS CLASSES: CLASS 12	CLASS 13	CLASS 14	CLASS 15	CLASS 16	CLASS 17	CLASS 18	CLASS 19	CLASS 20	CLASS 21
		26												
C20	8	1	17.0	2912	389	0	0	0	0	0	0	0	0	0
C20	11	13	17.0	2912	389	0	0	0	0	0	0	0	0	0
C20	12	9	17.0	2912	389	0	0	0	0	0	0	0	0	0
C20	14	1	17.0	2912	389	0	0	0	0	0	0	0	0	0
C20	15	1	17.0	2912	389	0	0	0	0	0	0	0	0	0
		25												
C21	16	6	14.0	4137	0	0	0	0	0	0	0	0	0	0
C21	18	15	14.0	4137	0	0	0	0	0	0	0	0	0	0
C21	19	1	14.0	4137	0	0	0	0	0	0	0	0	0	0
		22												
C22	7	1	6.0	1718	0	0	0	0	0	0	0	0	0	0
C22	10	1	6.0	1718	0	0	0	0	0	0	0	0	0	0
C22	11	21	6.0	1718	0	0	0	0	0	0	0	0	0	0
C22	13	1	6.0	1718	0	0	0	0	0	0	0	0	0	0
		24												
C23	15	1	11.0	2634	783	0	0	0	952	0	0	0	0	17
C23	17	22	11.0	2634	783	0	0	0	952	0	0	0	0	17
		23												
C25	14	3	15.0	3049	0	0	0	0	0	0	0	0	0	0
C25	15	1	15.0	3049	0	0	0	0	0	0	0	0	0	0
C25	17	20	15.0	3049	0	0	0	0	0	0	0	0	0	0
		24												
C26	14	22	20.0	5539	0	0	0	0	0	0	0	0	0	0
C26	15	7	20.0	5539	0	0	0	0	0	0	0	0	0	0
		29												
C27	9	1	23.0	4043	0	0	0	0	0	0	0	0	0	0
C27	16	16	23.0	4043	0	0	0	0	0	0	0	0	0	0
C27	17	5	23.0	4043	0	0	0	0	0	0	0	0	0	0

BUREAU OF LAND MANAGMENT
CALIFORNIA DESERT CONSERVATION AREA
1 DEGREE BY 1 DEGREE QUADRANGLE

BIOMASS STATISTICS FOR LOW ALTITUDE TRANSECTS
DATA INPUT FROM PRODUCTION USE INDEX TABLE

TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PERCENT GROUND COVER	TOTAL STANDING BIOMASS	PRODUCTION TO BIOMASS CLASS 22	CLASS 23	CLASS 24
		26					
C20	8	1	17.0	2912	1946	0	0
C20	11	13	17.0	2912	1946	0	0
C20	12	9	17.0	2912	1946	0	0
C20	14	1	17.0	2912	1946	0	0
C20	15	1	17.0	2912	1946	0	0
		25					
C21	16	6	14.0	4137	2277	0	0
C21	18	15	14.0	4137	2277	0	0
C21	19	1	14.0	4137	2277	0	0
		22					
C22	7	1	6.0	1718	467	85	0
C22	10	1	6.0	1718	467	85	0
C22	11	21	6.0	1718	467	85	0
C22	13	1	6.0	1718	467	85	0
		24					
C23	15	1	11.0	2634	121	0	0
C23	17	22	11.0	2634	121	0	0
		23					
C25	14	3	15.0	3049	2290	0	0
C25	15	1	15.0	3049	2290	0	0
C25	17	20	15.0	3049	2290	0	0
		24					
C26	14	22	20.0	5539	0	0	0
C26	15	7	20.0	5539	0	0	0
		29					
C27	9	1	23.0	4043	3264	0	0
C27	16	16	23.0	4043	3264	0	0
C27	17	5	23.0	4043	3264	0	0

NON-FORAGE CLASSES

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA
1 DEGREE BY 1 DEGREE QUADRANGLE

BIOMASS SUMMARY BY TRANSECT
RAW DATA - KILOGRAMS PER HECTARE

QUAD ID	TRANSECT	PAINT NUMBER	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	STANDING BIOMASS	TOTAL PRODUCTION	PERCENT COVER
				26			
20	C20	36	8	1	2912	388	17.0
20	C20	36	11	13	2912	388	17.0
20	C20	36	12	9	2912	388	17.0
20	C20	36	14	1	2912	388	17.0
20	C20	36	15	1	2912	388	17.0
				25			
20	C21	37	16	6	4137	600	14.0
20	C21	37	18	15	4137	600	14.0
20	C21	37	19	1	4137	600	14.0
				22			
20	C22	34	7	1	1718	297	6.0
20	C22	34	10	1	1718	297	6.0
20	C22	34	11	21	1718	297	6.0
20	C22	34	13	1	1718	297	6.0
				24			
20	C23	29	15	1	2634	618	11.0
20	C23	29	17	22	2634	618	11.0
				23			
20	C25	31	14	3	3049	381	15.0
20	C25	31	15	1	3049	381	15.0
20	C25	31	17	20	3049	381	15.0
				24			
20	C26	25	14	22	5539	1108	20.0
20	C26	25	15	7	5539	1108	20.0
				29			
20	C27	28	9	1	4043	482	23.0
20	C27	28	16	16	4043	482	23.0
20	C27	28	17	5	4043	482	23.0

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA
1 DEGREE BY 1 DEGREE QUADRANGLE

BIOMASS STATISTICS BY SPECTRAL CLASS
KILOGRAMS PER HECTARE

QUAD ID	TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PERCENT GROUND COVER	STANDING BIOMASS BY SPECTRAL CLASS	TOTAL PRODUCTION BY SPECTRAL CLASS
20	C20	15	1	17.0	3857.84	576.55
			25			
20	C21	16	6	14.0	2969.06	512.46
20	C21	18	15	14.0	3052.47	486.86
20	C21	19	1	14.0	3270.87	598.29
			22			
20	C22	7	1	6.0	24087.03	2537.49
20	C22	10	1	6.0	3911.03	568.76
20	C22	11	21	6.0	2357.75	357.54
20	C22	13	1	6.0	2022.40	312.90
			24			
20	C23	15	1	11.0	3857.84	576.55
20	C23	17	22	11.0	3429.37	538.69
			23			
20	C25	14	3	15.0	2430.28	361.38
20	C25	15	1	15.0	3857.84	576.55
20	C25	17	20	15.0	3429.37	538.69
			24			
20	C26	14	22	20.0	2430.28	361.38
20	C26	15	7	20.0	3857.84	576.55
			29			
20	C27	9	1	23.0	5325.36	824.00
20	C27	16	16	23.0	2969.06	512.46
20	C27	17	5	23.0	3429.37	538.69
20	C27	18	2	23.0	3052.47	486.86
			24			
20	C28	11	12	21.0	2357.75	357.54
20	C28	14	28	21.0	2430.28	361.38

BUREAU OF [illegible] MANAGEMENT
CALIFORNIA DESE[illegible] CONSERVATION AREA

BIOMASS STATISTICS BY SPECTRAL CLASS FOR
PRODUCTION TO BIOMASS CLASSES
KILOGRAMS PER HECTARE

QUAD ID	TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PRODUCTION TO BIOMASS CLASSES CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	CLASS 8	CLASS 9	CLASS 10	CLASS 11
			26											
20	C20	8	1	0.0	82.0	77.9	2.7	22.6	8.3	10.1	1.9	28.9	0.0	0.0
20	C20	11	13	0.0	12.8	27.0	4.0	4.5	62.0	0.0	0.7	0.1	47.4	0.0
20	C20	12	9	0.0	31.6	22.4	43.9	6.7	81.0	0.9	0.1	1.5	17.2	0.0
20	C20	14	1	0.0	6.3	31.1	1.8	3.1	47.2	0.0	1.6	1.4	77.4	0.0
20	C20	15	1	0.0	14.6	36.8	7.7	5.8	77.1	0.3	4.3	3.0	49.4	0.0
			25											
20	C21	16	6	0.0	6.9	4.9	1.1	3.0	236.1	0.0	0.5	0.0	102.2	0.0
20	C21	18	15	0.0	7.1	8.9	1.6	6.0	166.4	0.0	1.0	0.3	99.0	0.0
20	C21	19	1	0.0	0.0	0.0	0.0	2.5	441.7	0.0	0.0	0.0	75.8	0.0
			22											
20	C22	7	1	0.0	133.7	29.0	0.0	6.3	43.5	0.0	0.0	53.4	20.3	0.0
20	C22	10	1	0.0	64.3	32.9	0.8	4.5	101.3	0.0	0.0	1.0	29.5	0.0
20	C22	11	21	0.0	12.8	27.0	4.0	4.5	62.0	0.0	0.7	0.1	47.4	0.0
20	C22	13	1	0.0	15.4	78.9	2.4	5.0	59.2	0.0	2.0	0.0	27.6	0.0
			24											
20	C23	15	1	0.0	14.6	36.8	7.7	5.8	77.1	0.3	4.3	3.0	49.4	0.0
20	C23	17	22	0.0	11.2	40.1	4.5	6.9	94.6	0.0	1.7	2.4	97.8	0.0
			23											
20	C25	14	3	0.0	6.3	31.1	1.8	3.1	47.2	0.0	1.6	1.4	77.4	0.0
20	C25	15	1	0.0	14.6	36.8	7.7	5.8	77.1	0.3	4.3	3.0	49.4	0.0
20	C25	17	20	0.0	11.2	40.1	4.5	6.9	94.6	0.0	1.7	2.4	97.8	0.0
			24											
20	C26	14	22	0.0	6.3	31.1	1.8	3.1	47.2	0.0	1.6	1.4	77.4	0.0
20	C26	15	7	0.0	14.6	36.8	7.7	5.8	77.1	0.3	4.3	3.0	49.4	0.0
			29											
20	C27	9	1	0.0	76.4	49.3	3.0	10.1	86.1	0.9	4.1	3.4	52.5	0.0
20	C27	16	16	0.0	6.9	4.9	1.1	3.0	236.1	0.0	0.5	0.0	102.2	0.0
20	C27	17	5	0.0	11.2	40.1	4.5	6.9	94.6	0.0	1.7	2.4	97.8	0.0

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

BIOMASS STATISTICS BY SPECTRAL CLASS FOR
PRODUCTION TO BIOMASS CLASSES
KILOGRAMS PER HECTARE

QUAD ID	TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PRODUCTION TO BIOMASS CLASSES CLASS 12	CLASS 13	CLASS 14	CLASS 15	CLASS 16	CLASS 17	CLASS 18	CLASS 19	CLASS 20	CLASS 21
			26										
20	C20	8	1	89.9	109.8	1.3	86.1	7.5	0.0	0.0	0.0	0.0	0.8
20	C20	11	13	40.3	17.6	0.4	5.1	1.7	0.0	0.0	0.0	0.0	5.7
20	C20	12	9	67.7	37.8	3.4	24.6	2.1	0.0	0.0	0.0	0.0	5.9
20	C20	14	1	18.6	4.3	5.0	7.8	3.7	0.0	0.0	0.1	0.0	9.0
20	C20	15	1	55.8	15.4	8.5	36.5	8.0	0.0	0.0	0.1	0.0	10.4
			25										
20	C21	16	6	23.7	14.3	4.4	2.2	19.4	0.0	0.0	0.0	0.0	4.8
20	C21	18	15	20.9	4.4	1.1	5.9	28.3	0.0	0.0	0.0	0.0	6.3
20	C21	19	1	3.2	0.0	0.0	0.0	16.1	0.0	0.0	0.0	0.0	0.0
			22										
20	C22	7	1	54.5	71.0	0.0	3.1	1.1	0.0	0.0	0.0	0.0	3.9
20	C22	10	1	57.9	51.9	0.0	13.6	5.8	0.0	0.0	0.1	0.0	18.6
20	C22	11	21	40.3	17.6	0.4	5.1	1.7	0.0	0.0	0.0	0.0	5.7
20	C22	13	1	13.1	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
			24										
20	C23	15	1	55.8	15.4	8.5	36.5	8.0	0.0	0.0	0.1	0.0	10.4
20	C23	17	22	51.6	3.8	10.1	13.4	30.8	0.0	0.0	0.0	0.0	6.2
			23										
20	C25	14	3	18.6	4.3	5.0	7.8	3.7	0.0	0.0	0.1	0.0	9.0
20	C25	15	1	55.8	15.4	8.5	36.5	8.0	0.0	0.0	0.1	0.0	10.4
20	C25	17	20	51.6	3.8	10.1	13.4	30.8	0.0	0.0	0.0	0.0	6.2
			24										
20	C26	14	22	18.6	4.3	5.0	7.8	3.7	0.0	0.0	0.1	0.0	9.0
20	C26	15	7	55.8	15.4	8.5	36.5	8.0	0.0	0.0	0.1	0.0	10.4
			29										
20	C27	9	1	101.5	63.1	6.4	86.2	16.2	0.0	0.0	0.0	0.0	3.6
20	C27	16	16	23.7	14.3	4.4	2.2	19.4	0.0	0.0	0.0	0.0	4.8
20	C27	17	5	51.6	3.8	10.1	13.4	30.8	0.0	0.0	0.0	0.0	6.2

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

BIOMASS STATISTICS BY SPECTRAL CLASS FOR
PRODUCTION TO BIOMASS CLASSES
KILOGRAMS PER HECTARE

QUAD ID	TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PRODUCTION TO BIOMASS CLASS 22	CLASS 23	CLASS 24
			26			
20	C20	8	1	459.0	58.9	0.0
20	C20	11	13	113.4	14.7	0.0
20	C20	12	9	122.4	37.0	0.0
20	C20	14	1	139.5	3.5	0.0
20	C20	15	1	206.8	36.1	0.0
			25			
20	C21	16	6	88.7	0.1	0.0
20	C21	18	15	128.5	1.2	0.0
20	C21	19	1	58.7	0.2	0.0
			22			
20	C22	7	1	2114.3	3.4	0.0
20	C22	10	1	171.5	15.0	0.0
20	C22	11	21	113.4	14.7	0.0
20	C22	13	1	80.9	10.4	0.0
			24			
20	C23	15	1	206.8	36.1	0.0
20	C23	17	22	155.2	8.6	0.0
			23			
20	C25	14	3	139.5	3.5	0.0
20	C25	15	1	206.8	36.1	0.0
20	C25	17	20	155.2	8.6	0.0
			24			
20	C26	14	22	139.5	3.5	0.0
20	C26	15	7	206.8	36.1	0.0
			29			
20	C27	9	1	210.5	50.6	0.0
20	C27	16	16	88.7	0.1	0.0
20	C27	17	5	155.2	8.6	0.0

BUREAU OF L[illegible] MANAGEMENT
CALIFORNIA DESERT [illegible]ONSERVATION AREA

BIOMASS STATISTICS BY SPECTRAL CLASS FOR
PRODUCTION TO BIOMASS CLASSES
KILOGRAMS PER HECTARE

QUAD ID	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PRODUCTION TO BIOMASS CLASSES CLASS 1	CLASS 2	CLASS 3	CLASS 4	CLASS 5	CLASS 6	CLASS 7	CLASS 8	CLASS 9	CLASS 10	CLASS 11
5	1	87	0.0	233.1	16.8	0.0	108.5	5.4	0.0	0.0	0.0	0.0	0.0
2	4	9	0.0	157.3	0.0	0.0	0.0	0.0	0.0	0.0	88.3	0.0	0.0
2	5	6	0.0	157.3	0.0	0.0	0.0	0.0	0.0	0.0	88.3	0.0	0.0
5	6	21	0.0	137.2	76.9	0.0	23.2	7.1	7.6	0.0	102.8	0.0	0.0
20	7	63	0.0	133.7	29.0	0.0	6.3	43.5	0.0	0.0	53.4	20.3	0.0
20	8	174	0.0	82.0	77.9	2.7	22.6	8.3	10.1	1.9	28.9	0.0	0.0
20	9	67	0.0	76.4	49.3	3.0	10.1	80.1	0.9	4.1	3.4	52.5	0.0
20	10	86	0.0	64.3	32.9	0.8	4.5	101.3	0.0	0.0	1.0	29.5	0.0
20	11	323	0.0	12.8	27.0	4.0	4.5	62.0	0.0	0.7	0.1	47.4	0.0
20	12	181	0.0	31.6	22.4	43.9	6.7	81.0	0.9	0.1	1.5	17.2	0.0
20	13	10	0.0	15.4	78.9	2.4	5.0	59.2	0.0	2.0	0.0	27.6	0.0
20	14	405	0.0	6.3	31.1	1.8	3.1	47.2	0.0	1.6	1.4	77.4	0.0
20	15	265	0.0	14.6	36.8	7.7	5.8	77.1	0.3	4.3	3.0	49.4	0.0
20	16	118	0.0	6.9	4.9	1.1	3.0	236.1	0.0	0.5	0.0	102.2	0.0
20	17	296	0.0	11.2	40.1	4.5	6.9	94.6	0.0	1.7	2.4	97.8	0.0
20	18	191	0.0	7.1	8.9	1.6	6.0	166.4	0.0	1.0	0.3	99.0	0.0
20	19	24	0.0	0.0	0.0	0.0	2.5	441.7	0.0	0.0	0.0	75.8	0.0
5	28	6	0.0	0.0	5.7	0.0	5.1	86.3	0.0	0.0	0.0	106.3	0.0
		2352											

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

BIOMASS STATISTICS BY SPECTRAL CLASS FOR
PRODUCTION TO BIOMASS CLASSES
KILOGRAMS PER HECTARE

QUAD ID	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PRODUCTION TO BIOMASS CLASSES CLASS 12	CLASS 13	CLASS 14	CLASS 15	CLASS 16	CLASS 17	CLASS 18	CLASS 19	CLASS 20	CLASS 21
5	1	87	0.0	99.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	4	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	5	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	6	21	19.0	129.7	0.0	25.4	0.0	0.0	0.0	0.0	0.0	0.0
20	7	63	54.5	71.0	0.0	3.1	1.1	0.0	0.0	0.0	0.0	3.9
20	8	174	89.9	109.8	1.3	86.1	7.5	0.0	0.0	0.0	0.0	0.8
20	9	87	101.5	63.1	6.4	86.2	16.2	0.0	0.0	0.0	0.0	3.6
20	10	86	57.9	51.9	0.0	13.6	5.8	0.0	0.0	0.1	0.0	18.6
20	11	323	40.3	17.6	0.4	5.1	1.7	0.0	0.0	0.0	0.0	5.7
20	12	181	67.7	37.8	3.4	24.6	2.1	0.0	0.0	0.0	0.0	5.9
20	13	10	13.1	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.2
20	14	405	18.6	4.3	5.0	7.8	3.7	0.0	0.0	0.1	0.0	9.0
20	15	265	55.8	15.4	8.5	36.5	8.0	0.0	0.0	0.1	0.0	10.4
20	16	118	23.7	14.3	4.4	2.2	19.4	0.0	0.0	0.0	0.0	4.8
20	17	296	51.6	3.8	10.1	13.4	30.8	0.0	0.0	0.0	0.0	6.2
20	18	191	20.9	4.4	1.1	5.9	28.3	0.0	0.0	0.0	0.0	6.3
20	19	24	3.2	0.0	0.0	0.0	16.1	0.0	0.0	0.0	0.0	0.0
5	28	6	0.0	29.5	11.7	0.0	33.7	0.0	0.0	0.0	0.0	10.5
		2352										

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

BIOMASS STATISTICS BY SPECTRAL CLASS FOR
PRODUCTION TO BIOMASS CLASSES
KILOGRAMS PER HECTARE

PUI = 0

QUAD ID	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	PRODUCTION TO BIOMASS 0.1 CLASS 22	0.2 CLASS 23	0.3 CLASS 24
5	1	87	1366.9	0.0	0.0
2	4	9	6720.4	0.0	0.0
2	5	6	6720.4	0.0	0.0
5	6	21	914.3	10.9	0.0
20	7	63	2114.3	3.4	0.0
20	8	174	459.0	58.9	0.0
20	9	87	210.5	50.6	0.0
20	10	86	171.5	15.0	0.0
20	11	323	113.4	14.7	0.0
20	12	181	122.4	37.0	0.0
20	13	10	80.9	10.4	0.0
20	14	405	139.5	3.5	0.0
20	15	265	206.8	36.1	0.0
20	16	118	88.7	0.1	0.0
20	17	296	155.2	8.6	0.0
20	18	191	128.5	1.2	0.0
20	19	24	58.7	0.2	0.0
5	28	6	36.6	0.0	0.0
		2352			

TO CALC. TOTAL FORAGE PROD.:

TOTAL PROD. (Pg. 9.001) − PROD. IN CLASS 22 + CLASS 23 + CLASS 24 (PUI Classes = 0)

Class 1 = T.P. 1830.12 − NON-FORAGE PROD 1366.9 = TFP 463.22

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

INPUT BIOMASS STATISTICS FOR SPECTRAL CLASSES

SPECTRAL CLASS	STANDING BIOMASS KG/HA	TOTAL PRODUCTION KG/HA
1	17527.79	1830.12
2	0.0	0.0
3	0.0	0.0
4	69659.94	6965.98
5	69659.94	6965.98
6	12937.55	1454.09
7	24087.02	2537.49
8	7901.64	1047.80
9	5325.36	824.00
10	3911.03	568.76
11	2357.75	357.54
12	3187.87	506.39
13	2022.40	312.90
14	2430.28	361.38
15	3857.84	576.55
16	2969.06	512.46
17	3429.37	538.69
18	3052.47	486.86
19	3270.87	598.29
20	0.0	0.0
23	0.0	0.0
25	0.0	0.0
26	0.0	0.0
27	0.0	0.0
28	1693.50	325.55

RAW INPUT DATA TO BE AGGREGATED BY QUAD GROUP
GRAZING ALLOTMENT, LAND OWNERSHIP, AND
SLOPE GRADIENT.

TRONA WEST TRANSECT 25

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

100 CLASS TRANSECTS

QUAD	QUAD ID	TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	CALC AREA	PAINT REGION	CENTROID LINE	CENTROID SAMPLE
				26				
TRONAW	20	C20	42	1	27.00	36	1172	799
TRONAW	20	C20	51	12	27.00	36	1172	799
TRONAW	20	C20	52	1	27.00	36	1172	799
TRONAW	20	C20	58	9	27.00	36	1172	799
TRONAW	20	C20	59	1	27.00	36	1172	799
TRONAW	20	C20	71	1	27.00	36	1172	799
				25				
TRONAW	20	C21	78	17	27.00	37	1196	880
TRONAW	20	C21	79	1	27.00	37	1196	880
TRONAW	20	C21	80	4	27.00	37	1196	880
				22				
TRONAW	20	C22	51	19	26.50	34	1145	1083
TRONAW	20	C22	52	2	26.50	34	1145	1083
TRONAW	20	C22	53	1	26.50	34	1145	1083
TRONAW	20	C22	58	1	26.50	34	1145	1083
TRONAW	20	C22	62	1	26.50	34	1145	1083
				24				
TRONAW	20	C23	77	20	24.00	29	1080	1250
TRONAW	20	C23	90	3	24.00	29	1080	1250
				23				
TRONAW	20	C25	52	1	27.00	31	1107	378
TRONAW	20	C25	54	1	27.00	31	1107	378
TRONAW	20	C25	77	21	27.00	31	1107	378
TRONAW	20	C25	87	1	27.00	31	1107	378
				24				
TRONAW	20	C26	52	25	29.00	25	1010	730
TRONAW	20	C26	54	2	29.00	25	1010	730
TRONAW	20	C26	71	1	29.00	25	1010	730
TRONAW	20	C26	83	1	29.00	25	1010	730
				29				
TRONAW	20	C27	77	6	24.00	28	1055	865
TRONAW	20	C27	78	1	24.00	28	1055	865

TABULATION OF THE ORIGINAL 100
SPECTRAL CLASSES BY TRANSECT

TRONA WEST TRANSECT 25

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

28 CLASS TRANSECTS

QUAD	QUAD ID	TRANSECT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	CALC AREA	PAINT REGION	CENTROID LINE	CENTROID SAMPLE
TRONAW	20	C22	11	21	26.50	34	1145	1083
TRONAW	20	C22	13	1	26.50	34	1145	1083
				24				
TRONAW	20	C23	15	1	24.00	29	1080	1250
TRONAW	20	C23	17	22	24.00	29	1080	1250
				23				
TRONAW	20	C25	14	3	27.00	31	1107	378
TRONAW	20	C25	15	1	27.00	31	1107	378
TRONAW	20	C25	17	20	27.00	31	1107	378
				24				
TRONAW	20	C26	14	22	29.00	25	1010	730
TRONAW	20	C26	15	7	29.00	25	1010	730
				29				
TRONAW	20	C27	9	1	24.00	28	1055	865
TRONAW	20	C27	16	16	24.00	28	1055	865
TRONAW	20	C27	17	5	24.00	28	1055	865
TRONAW	20	C27	18	2	24.00	28	1055	865
				24				
TRONAW	20	C28	11	12	42.50	26	1018	314
TRONAW	20	C28	14	28	42.50	26	1018	314
				40				
TRONAW	20	C29	10	17	29.50	27	1042	513
TRONAW	20	C29	11	11	29.50	27	1042	513
TRONAW	20	C29	13	1	29.50	27	1042	513
				29				
TRONAW	20	C30	9	3	28.00	24	999	925
TRONAW	20	C30	15	15	28.00	24	999	925
TRONAW	20	C30	17	8	28.00	24	999	925
				26				
TRONAW	20	C32	11	32	50.00	18	862	487
TRONAW	20	C32	12	17	50.00	18	862	487

TABULATION OF THE 28 SPECTRAL
VEGETATION CLASSES BY TRANSECT

AGGREGATION OF BIOMASS AND RANGE CARRYING CAPACITY INFORMATION

HYRUM JOHNSON

AGGREGATION OF BIOMASS AND RANGE CARRYING CAPACITY INFORMATION

INITIAL AGGREGATIONS:

- LAND OWNERSHIP

  TALLY INFORMATION BY PUBLIC AND PRIVATE OWNERSHIP

- GRAZING ALLOTMENT

  TALLY INFORMATION BY EACH 53 LEASED, ALLOTMENTS IN THE CDCA

- SLOPE GRADIENT

  - TALLY INFORMATION BY DIGITAL SLOPE CATEGORY 0 - 25 PERCENT, 26 - 50 PERCENT, AND GREATER THAN 50 PERCENT.

QUAD GROUPINGS FOR AGGREGATION

PROBLEM: CLASSIFICATION IS NOT ENTIRELY CONSISTENT OVER THE CDCA. SIMILAR SPECTRAL CLASSES ARE INTERPRETED TO INDICATE DIFFERENT BIOMASS LEVELS IN VARIOUS PARTS OF THE DESERT.

SOLUTION: STRATIFY BY GEOGRAPHIC AREA USING THE $1^{o} \times 1^{o}$ QUADS AS DISCRETE UNIT/AREAS.

GRAZING ALLOTMENT NUMBER IDENTIFICATION

FOR NUMBERS 1 - 52 SPECIFIED FOR GRAZING ALLOTMENTS, THOSE NUMBERS CORRESPOND DIRECTLY TO THE GRAZING ALLOTMENT I.D. SPECIFIED ON THE MAP.

THE FOLLOWING TABLE EXPLAINS THE SITUATION FOR NUMBERS GREATER THAN 52.

GRAZING ALLOTMENT NUMBERS	
139	GRAZING ALLOTMENT 39A
143	MITCHELL CAVERNS STATE PARK
146	GRAZING ALLOTMENT 46A
200	CHINA LAKE U.S.N. ORDNANCE TEST STATION
201	DEATH VALLEY NATIONAL MONUMENT
202	CAMP IRWIN
204	EDWARDS AIR FORCE BASE
205	GEORGE AIR FORCE BASE
206	MSN TARGET AREA IN EL CENTRO WEST QUAD
207	U.S.N. AUXILLARY AIR STATION
210	SADDLEBACK BUTTE STATE PARK
220	JOSHUA TREE NATIONAL MONUMENT
221	MARINE CORPS. BULLION MTNS.
222	MISSION CREEK INDIAN RESERVATION
223	ANZA BORREGO STATE PARK
224	CHOCOLATE MTNS. GUNNERY RANGE
225	NAVAL RESERVE
248	OUTSIDE CDCA OUTSIDE INTERNATIONAL BORDER MEXICO ONLY
253	OUTSIDE CDCA, BUT INSIDE QUAD PERIMETER
254	INSIDE CDCA, OUTSIDE ANY GRAZING ALLOTMENT OR SPECIAL

$1^{o} \times 1^{o}$ QUAD GROUPS FOR AGGREGATION

GROUP 1

- BAKERSFIELD EAST — ALLOTMENTS 12 - 19
- TRONA WEST — 21 - 23
- SAN BERNARDINO WEST — 25 - 37

AND ALLOTMENT NUMBERS 202, 204, 205, 210 AND 254 IF AND ONLY IF THEY RESIDE IN THE FOLLOWING $1^{o} \times 1^{o}$ QUADS:

FRESNO
BAKERSFIELD EAST
LOS ANGELES EAST
SAN BERNARDINO EAST
SAN BERNARDINO WEST
TRONA WEST

GROUP 2

- DEATH VALLEY WEST — ALLOTMENTS 1 - 11,
- GOLDFIELD WEST

AND ALLOTMENT NUMBERS 200, 201 AND 254 IF AND ONLY IF THEY RESIDE IN THE FOLLOWING $1^{o} \times 1^{o}$ QUADS:

DEATH VALLEY WEST
MARIPOSA EAST
GOLDFIELD WEST

GROUP 3

- KINGMAN WEST
- NEEDLES EAST

ALLOTMENTS 20, 24, 38 - 51, 53, 139, 146.

AND ALLOTMENT NUMBERS 254 IF AND ONLY IF THEY RESIDE IN THE FOLLOWING 1° x 1° QUADS:

KINGMAN WEST
DEATH VALLEY EAST
TRONA EAST
LAS VEGAS WEST
KINGMAN EAST
NEEDLES EAST

GROUP 4

- SALTON SEA WEST
- NEEDLES EAST
- KINGMAN WEST

ALLOTMENTS 52

AND ALLOTMENT NUMBERS 220, 221, 222, AND 254 IF AND ONLY IF THEY RESIDE IN THE FOLLOWING 1° x 1° QUADS:

SANTA ANA EAST
SAN DIEGO EAST
NEEDLES WEST
SALTON SEA EAST

GROUP 5

- SALTON SEA WEST
- NEEDLES EAST

ALLOTMENTS 206, 207, 223, 224, 225, AND 254 IF AND ONLY IF THEY RESIDE IN THE FOLLOWING $1^{o} \times 1^{o}$ QUADS:

SALTON SEA WEST
EL CENTRO WEST
EL CENTRO EAST

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

GRAZING ALLOTMENT ATTRIBUTES

QUAD	GRAZING ALLOTMENT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	LAND OWNERSHIP	SLOPE CATEGORY	PERCENT OF GRAZING ALLOTMENT: SPECTRAL CLASS WITH NO BIOMASS STATISTICS	CLASS 28	SLOPE CATEGORIES
LOSANG	12	5	1	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	6	5	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	7	128	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	7	13	PRIVATE	0-25PCT	0.0	0.0	99.40
LOSANG	12	8	479	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	8	21	PRIVATE	0-25PCT	0.0	0.0	99.40
LOSANG	12	8	1	PRIVATE	26-50PCT	0.0	0.0	0.60
LOSANG	12	9	74	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	9	4	PRIVATE	0-25PCT	0.0	0.0	99.40
LOSANG	12	11	287	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	11	1	PUBLIC	26-50PCT	0.0	0.0	0.60
LOSANG	12	11	25	PRIVATE	0-25PCT	0.0	0.0	99.40
LOSANG	12	12	532	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	12	1	PUBLIC	26-50PCT	0.0	0.0	0.60
LOSANG	12	12	25	PRIVATE	0-25PCT	0.0	0.0	99.40
LOSANG	12	13	1	PRIVATE	0-25PCT	0.0	0.0	99.40
LOSANG	12	14	141	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	14	2	PUBLIC	26-50PCT	0.0	0.0	0.60
LOSANG	12	14	12	PRIVATE	0-25PCT	0.0	0.0	99.40
LOSANG	12	14	1	PRIVATE	26-50PCT	0.0	0.0	0.60
LOSANG	12	15	152	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	15	1	PUBLIC	26-50PCT	0.0	0.0	0.60
LOSANG	12	15	11	PRIVATE	0-25PCT	0.0	0.0	99.40
LOSANG	12	16	2	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	17	59	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	17	1	PUBLIC	26-50PCT	0.0	0.0	0.60
LOSANG	12	17	1	PRIVATE	26-50PCT	0.0	0.0	0.60
LOSANG	12	18	14	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	18	2	PUBLIC	26-50PCT	0.0	0.0	0.60
LOSANG	12	19	4	PUBLIC	0-25PCT	0.0	0.0	99.40
LOSANG	12	19	1	PUBLIC	26-50PCT	0.0	0.0	0.60
			2002			0.0	0.0	
TRONAW	13	7	4	PUBLIC	0-25PCT	0.0	0.0	100.00
TRONAW	13	7	3	PRIVATE	0-25PCT	0.0	0.0	100.00
TRONAW	13	8	2	PUBLIC	0-25PCT	0.0	0.0	100.00
BAKERE	13	8	1	PRIVATE	0-25PCT	0.0	0.0	100.00
BAKERE	13	9	6	PUBLIC	0-25PCT	0.0	0.0	100.00
TRONAW	13	9	76	PUBLIC	0-25PCT	0.0	0.0	100.00
LOSANG	13	9	13	PUBLIC	0-25PCT	0.0	0.0	100.00
TRONAW	13	9	27	PRIVATE	0-25PCT	0.0	0.0	100.00
LOSANG	13	9	9	PRIVATE	0-25PCT	0.0	0.0	100.00
TRONAW	13	10	3	PUBLIC	0-25PCT	0.0	0.0	100.00

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

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STANDING BIOMASS AND TOTAL PRODUCTION
FOR SPECTRAL CLASSES BY GRAZING ALLOTMENT, LAND OWNERSHIP
AND THREE SLOPE CATEGORIES

- - - - RAW INPUT DATA - - - -

QUAD	GRAZING ALLOTMENT	SPECTRAL CLASS	SPECTRAL CLASS FREQUENCY	STANDING BIOMASS KG/HA	TOTAL PRODUCTION KG/HA	LAND OWNERSHIP	SLOPE CATEGORY
LOSANG	12	5	1	69659.94	6965.98	PUBLIC	0-25PCT
LOSANG	12	6	5	12937.55	1454.09	PUBLIC	0-25PCT
LOSANG	12	7	128	24087.02	2537.49	PUBLIC	0-25PCT
LOSANG	12	7	13	24087.02	2537.49	PRIVATE	0-25PCT
LOSANG	12	8	479	7901.64	1047.80	PUBLIC	0-25PCT
LOSANG	12	8	21	7901.64	1047.80	PRIVATE	0-25PCT
LOSANG	12	8	1	7901.64	1047.80	PRIVATE	26-50PCT
LOSANG	12	9	74	5325.36	824.00	PUBLIC	0-25PCT
LOSANG	12	9	4	5325.36	824.00	PRIVATE	0-25PCT
LOSANG	12	11	287	2357.75	357.54	PUBLIC	0-25PCT
LOSANG	12	11	1	2357.75	357.54	PUBLIC	26-50PCT
LOSANG	12	11	25	2357.75	357.54	PRIVATE	0-25PCT
LOSANG	12	12	532	3187.87	506.39	PUBLIC	0-25PCT
LOSANG	12	12	1	3187.87	506.39	PUBLIC	26-50PCT
LOSANG	12	12	25	3187.87	506.39	PRIVATE	0-25PCT
LOSANG	12	13	1	2022.40	312.90	PRIVATE	0-25PCT
LOSANG	12	14	141	2430.28	361.38	PUBLIC	0-25PCT
LOSANG	12	14	2	2430.28	361.38	PUBLIC	26-50PCT
LOSANG	12	14	12	2430.28	361.38	PRIVATE	0-25PCT
LOSANG	12	14	1	2430.28	361.38	PRIVATE	26-50PCT
LOSANG	12	15	152	3857.84	576.55	PUBLIC	0-25PCT
LOSANG	12	15	1	3857.84	576.55	PUBLIC	26-50PCT
LOSANG	12	15	11	3857.84	576.55	PRIVATE	0-25PCT
LOSANG	12	16	2	2969.06	512.46	PUBLIC	0-25PCT
LOSANG	12	17	59	3429.37	538.69	PUBLIC	0-25PCT
LOSANG	12	17	1	3429.37	538.69	PUBLIC	26-50PCT
LOSANG	12	17	1	3429.37	538.69	PRIVATE	26-50PCT
LOSANG	12	18	14	3052.47	486.86	PUBLIC	0-25PCT
LOSANG	12	18	2	3052.47	486.86	PUBLIC	26-50PCT
LOSANG	12	19	4	3270.87	598.29	PUBLIC	0-25PCT
LOSANG	12	19	1	3270.87	598.29	PUBLIC	26-50PCT
			2002				
TRONAW	13	7	4	24087.02	2537.49	PUBLIC	0-25PCT
TRONAW	13	7	3	24087.02	2537.49	PRIVATE	0-25PCT
TRONAW	13	8	2	7901.64	1047.80	PUBLIC	0-25PCT
BAKERE	13	8	1	7901.64	1047.80	PRIVATE	0-25PCT
LOSANG	13	9	13	5325.36	824.00	PUBLIC	0-25PCT
TRONAW	13	9	76	5325.36	824.00	PUBLIC	0-25PCT

RAW INPUT DATA FOR GRAZING ALLOTMENT #12

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

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STANDING BIOMASS BY SLOPE CATEGORY
AND LAND OWNERSHIP
BIOMASS IN KILOGRAMS

GRAZING ALLOTMENT	SPECTRAL CLASS	PUBLIC 26-50PCT SLOPE	PRIVATE 26-50PCT SLOPE	TOTAL 26-50PCT SLOPE	PUBLIC GT50PCT SLOPE	PRIVATE GT50PCT SLOPE	TOTAL GT50PCT SLOPE	PIXELS
9	15	373850.19	26082.57	399932.75	17338.38	2173.55	19561.93	12639
9	16	0.0	0.0	0.0	0.0	0.0	0.0	246
9	17	19602.91	0.0	19602.91	0.0	0.0	0.0	4127
9	18	11764.91	0.0	11764.91	0.0	0.0	0.0	3336
9	19	2993.82	0.0	2993.82	0.0	0.0	0.0	2588
9	20	0.0	0.0	0.0	0.0	0.0	0.0	634
9	21	0.0	0.0	0.0	0.0	0.0	0.0	379
9	23	0.0	0.0	0.0	0.0	0.0	0.0	171
9	24	0.0	0.0	0.0	0.0	0.0	0.0	76
9	25	0.0	0.0	0.0	0.0	0.0	0.0	164
9	27	220733.12	12039.94	232773.06	16053.32	0.0	16053.32	3420
9	28	163962.06	0.0	163962.06	12776.27	0.0	12776.27	2299
		22977744.0	1108133.00	24085888.0	572181.94	91272.61	763454.75	135714
10	5	0.0	0.0	0.0	0.0	0.0	0.0	1
10	6	0.0	0.0	0.0	0.0	0.0	0.0	57
10	7	50024.36	0.0	50024.36	100048.69	3848.03	103896.69	897
10	8	56122.77	3301.34	59424.11	79232.12	39616.09	118848.19	1803
10	9	18252.82	0.0	18252.82	18252.82	3650.56	21903.38	376
10	11	4452.63	0.0	4452.63	95731.62	24489.50	120221.06	1183
10	12	0.0	0.0	0.0	85908.31	34827.72	120736.00	2345
10	14	0.0	0.0	0.0	12485.29	62426.44	74911.69	963
10	15	8694.19	0.0	8694.19	54338.67	45644.49	99983.12	1149
10	16	0.0	0.0	0.0	0.0	0.0	0.0	3
10	17	1031.73	0.0	1031.73	5158.66	0.0	5158.66	81
10	18	0.0	0.0	0.0	0.0	0.0	0.0	2
10	23	0.0	0.0	0.0	0.0	0.0	0.0	10
10	24	0.0	0.0	0.0	0.0	0.0	0.0	12
10	25	0.0	0.0	0.0	0.0	0.0	0.0	40
10	26	983.63	0.0	983.63	20656.18	19672.55	40328.74	42
10	27	0.0	0.0	0.0	0.0	0.0	0.0	2
10	28	0.0	0.0	0.0	0.0	0.0	0.0	77
		139552.05	3301.34	142863.37	471812.19	234175.19	705987.44	9023
11	1	0.0	0.0	0.0	0.0	0.0	0.0	18
11	2	0.0	0.0	0.0	0.0	0.0	0.0	7
11	3	0.0	0.0	0.0	0.0	0.0	0.0	22
11	4	3253098.00	0.0	3253098.00	1493088.00	0.0	1493088.00	914
11	5	0.0	0.0	0.0	0.0	0.0	0.0	634
11	6	512527.00	0.0	512527.00	148363.00	0.0	148363.00	302

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

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STANDING BIOMASS AND TOTAL PRODUCTION BY LAND OWNERSHIP
KILOGRAMS PER GRAZING ALLOTMENT

GRAZING ALLOTMENT	SPECTRAL CLASS	PUBLIC STANDING BIOMASS	PRIVATE STANDING BIOMASS	TOTAL STANDING BIOMASS	PUBLIC TOTAL PRODUCTION	PRIVATE TOTAL PRODUCTION	COMBINED TOTAL PRODUCTION	TOTAL PIXELS
9	19	1680278.00	240253.81	1920531.00	212912.12	30443.12	243355.19	2566
9	20	0.0	0.0	0.0	0.0	0.0	0.0	634
9	21	0.0	0.0	0.0	0.0	0.0	0.0	399
9	23	0.0	0.0	0.0	0.0	0.0	0.0	171
9	24	0.0	0.0	0.0	0.0	0.0	0.0	76
9	25	0.0	0.0	0.0	0.0	0.0	0.0	164
9	27	13364336.0	361199.56	13725585.0	2089051.00	56460.87	2145511.00	3420
9	28	3702937.00	1192451.00	4895438.00	550789.81	177367.62	728157.44	2299
		317368032.	26424432.0	344292352.	49948208.0	4045263.00	53993456.0	135714
10	5	0.0	0.0	0.0	0.0	0.0	0.0	1
10	6	87669.00	37090.78	124759.75	16125.98	6822.53	22948.50	37
10	7	3197709.00	253969.81	3451678.00	486101.87	38607.37	524709.25	897
10	8	4321453.00	1630861.00	5952314.00	678460.31	256042.25	934502.56	1803
10	9	1233888.00	138721.37	1372609.00	192044.66	21590.75	213634.81	376
10	11	2489020.00	144710.56	2633730.00	413986.75	24069.00	438055.69	1183
10	12	5003542.00	441151.06	5444733.00	860977.56	75909.81	936887.37	2345
10	14	1069572.00	266352.81	1335924.00	150598.19	37503.06	188101.25	963
10	15	1999562.00	497742.37	2497404.00	296872.25	73895.31	370767.56	1149
10	16	0.0	0.0	0.0	0.0	0.0	0.0	3
10	17	75316.31	8253.86	83570.12	9341.64	1023.74	10365.37	81
10	18	1680.70	0.0	1680.70	215.59	0.0	215.59	2
10	23	0.0	0.0	0.0	0.0	0.0	0.0	10
10	24	0.0	0.0	0.0	0.0	0.0	0.0	12
10	25	0.0	0.0	0.0	0.0	0.0	0.0	40
10	26	21639.81	19672.55	41312.36	2557.30	2324.82	4882.12	42
10	27	8026.66	0.0	8026.66	1254.69	0.0	1254.69	2
10	28	142668.31	21293.78	163962.06	21220.77	3167.28	24388.05	77
		19651824.0	3459815.00	23111648.0	3129752.00	540955.75	3670708.00	9023
11	1	0.0	0.0	0.0	0.0	0.0	0.0	18
11	2	0.0	0.0	0.0	0.0	0.0	0.0	7
11	3	0.0	0.0	0.0	0.0	0.0	0.0	22
11	4	7623926.00	0.0	7623926.00	793552.31	0.0	793552.31	914
11	5	0.0	0.0	0.0	0.0	0.0	0.0	634
11	6	1011566.37	6743.78	1018310.12	186068.87	1240.46	187309.31	302
11	7	8731171.00	103896.69	8835067.00	1327274.00	15793.92	1343067.00	2296
11	8	11013269.0	320230.00	11333499.0	1729061.00	50275.49	1779336.00	3433
11	9	1569742.00	0.0	1569742.00	244316.25	0.0	244316.25	430
11	10	716345.94	91415.50	807762.44	138313.69	17650.91	155964.56	539
11	11	4929065.00	155842.12	5084907.00	819827.06	25920.46	845747.50	2284

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

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TOTAL PRODUCTION BY SLOPE CATEGORY AND LAND OWNERSHIP
BIOMASS IN KILOGRAMS

GRAZING ALLOTMENT	SPECTRAL CLASS	PUBLIC 26-50PCT SLOPE	PRIVATE 26-50PCT SLOPE	TOTAL 26-50PCT SLOPE	PUBLIC GT50PCT SLOPE	PRIVATE GT50PCT SLOPE	TOTAL GT50PCT SLOPE	PIXELS
9	19	2993.82	0.0	2993.82	0.0	0.0	0.0	2566
9	20	0.0	0.0	0.0	0.0	0.0	0.0	634
9	21	0.0	0.0	0.0	0.0	0.0	0.0	399
9	23	0.0	0.0	0.0	0.0	0.0	0.0	171
9	24	0.0	0.0	0.0	0.0	0.0	0.0	76
9	25	0.0	0.0	0.0	0.0	0.0	0.0	164
9	27	220733.12	12039.94	232773.06	16053.32	0.0	16053.32	3420
9	28	163962.06	0.0	163962.06	12776.27	0.0	12776.27	2299
		22977744.0	1108133.00	24085838.0	672181.94	91272.81	763454.75	135714
10	5	0.0	0.0	0.0	0.0	0.0	0.0	1
10	6	0.0	0.0	0.0	0.0	0.0	0.0	37
10	7	50024.36	0.0	50024.36	100048.69	3848.03	103896.69	897
10	8	56122.77	3301.34	59424.11	79232.12	39616.09	118848.19	1803
10	9	18252.82	0.0	18252.82	18252.82	3650.56	21903.38	376
10	11	4452.63	0.0	4452.63	95731.62	24489.50	120221.06	1183
10	12	0.0	0.0	0.0	85908.31	34827.72	120736.00	2345
10	14	0.0	0.0	0.0	12485.29	62426.44	74911.69	963
10	15	8694.19	0.0	8694.19	54338.67	45644.49	99983.12	1149
10	16	0.0	0.0	0.0	0.0	0.0	0.0	3
10	17	1031.73	0.0	1031.73	5158.66	0.0	5158.66	81
10	18	0.0	0.0	0.0	0.0	0.0	0.0	2
10	23	0.0	0.0	0.0	0.0	0.0	0.0	10
10	24	0.0	0.0	0.0	0.0	0.0	0.0	12
10	25	0.0	0.0	0.0	0.0	0.0	0.0	40
10	26	983.63	0.0	983.63	20656.18	19672.55	40328.74	42
10	27	0.0	0.0	0.0	0.0	0.0	0.0	2
10	28	0.0	0.0	0.0	0.0	0.0	0.0	77
		139562.06	3301.34	142863.37	471812.19	234175.19	705987.44	9023
11	1	0.0	0.0	0.0	0.0	0.0	0.0	18
11	2	0.0	0.0	0.0	0.0	0.0	0.0	7
11	3	0.0	0.0	0.0	0.0	0.0	0.0	22
11	4	3253098.00	0.0	3253098.00	1493088.00	0.0	1493088.00	914
11	5	0.0	0.0	0.0	0.0	0.0	0.0	634
11	6	512527.00	0.0	512527.00	148363.00	0.0	148363.00	302
11	7	2620505.00	0.0	2620505.00	661860.62	0.0	661860.62	2296
11	8	2347252.00	3301.34	2350553.00	663569.37	0.0	663569.37	3433
11	9	478223.81	0.0	478223.81	124119.12	0.0	124119.12	430
11	10	76430.19	0.0	76430.19	16484.94	0.0	16484.94	539
11	11	256252.69	0.0	258252.69	93505.31	0.0	93505.31	2284

RANGE CARRYING CAPACITY

- VALUES FOR RENEWABLE FORGE PRODUCTION (RFP) ARE REDUCED TO AUM'S.

DEFINITION: AUM OR ANIMAL UNIT MONTH IS THE AMOUNT AT FORAGE REQUIRED TO SUSTAIN A COW CALF FOR ONE MONTH - 450 KILOGRAMS.

- THE KILOGRAMS OF RFP ARE DIVIDED BY 450 FOR EACH ALLOTMENT TO OBTAIN RANGE CARRYING CAPACITY.

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

STANDING BIOMASS BY SLOPE CATEGORY
AND LAND OWNERSHIP
BIOMASS IN METRIC TONS

GRAZING ALLOTMENT	PUBLIC 0-25PCT SLOPE	PRIVATE 0-25 SLOPE	TOTAL 0-25PCT SLOPE	PUBLIC 26-50PCT SLOPE	PRIVATE 26-50PCT SLOPE	TOTAL 26-50PCT SLOPE	PUBLIC GT50PCT SLOPE	PRIVATE GT50PCT SLOPE	TOTAL GT50PCT SLOPE	PIXELS
1	573.43	0.0	573.43	0.0	0.0	0.0	0.0	0.0	0.0	208
2	20929.60	547.56	21477.13	262.07	3.30	265.37	650.78	0.0	650.76	6608
3	55277.05	6731.15	62008.19	11624.43	308.56	11932.99	1464.60	154.68	1619.28	27095
4	133199.00	4800.14	137999.12	8128.70	49.77	8178.47	310.08	0.0	310.08	56707
5	26738.81	3568.18	30307.01	6374.98	1098.62	7473.60	356.76	28.37	385.13	15311
6	19905.42	1359.93	21265.41	2291.38	145.14	2436.51	0.0	0.0	0.0	8745
7	10824.98	1536.21	12361.20	471.35	127.83	599.18	0.0	1.50	1.50	5334
8	123622.87	0.0	123622.87	14999.61	0.0	14999.61	805.46	0.0	805.46	38192
9	290691.81	24032.61	314724.81	22813.79	1108.13	23921.93	659.41	91.27	750.68	135714
10	18897.82	3201.05	22098.86	139.56	3.30	142.86	471.81	234.18	705.99	9023
11	42110.99	2438.81	44549.77	10834.77	3.30	10838.07	3684.36	0.0	3684.36	23156
12	7024.58	456.65	7481.23	17.35	8.82	26.16	0.0	0.0	0.0	2002
13	7231.32	1413.39	8644.71	0.0	0.0	0.0	0.0	0.0	0.0	4131
14	482917.62	386979.31	869897.44	17390.65	985.27	18375.90	516.06	25.05	541.11	387870
15	22378.24	32479.74	54857.96	0.0	0.0	0.0	0.0	0.0	0.0	27028
16	2683.65	591.62	3275.27	326.49	65.14	391.62	0.0	0.0	0.0	241
17	540771.06	426769.12	967541.19	108313.62	37669.95	145983.69	3860.14	1037.62	4897.76	136732
18	854.39	60.79	915.18	47.49	35.55	83.05	0.0	3.41	3.41	269
19	220851.06	16505.25	237356.31	172175.56	5379.70	177555.25	39848.14	195.06	40043.21	61197
20	46407.01	1367.69	47774.70	10113.72	620.34	10734.06	1653.95	48.41	1702.36	32161
21	251345.19	298621.69	549966.81	58924.21	74328.62	133252.94	1565.20	895.32	2460.52	53176
22	5839.24	4806.54	10645.79	0.0	0.0	0.0	0.0	0.0	0.0	5267
23	30181.32	10677.65	40858.97	0.0	0.0	0.0	0.0	0.0	0.0	20439
24	12263.29	1350.72	13614.02	13.69	10.18	23.88	0.0	0.0	0.0	7060
25	13878.89	323.20	14202.08	2431.41	127.27	2558.68	35.42	0.0	35.42	3537
26	79597.75	77593.37	157191.19	723.87	1265.34	1989.20	404.75	446.78	851.53	78268
27	6662.20	1707.35	8369.55	0.0	0.0	0.0	16.38	6.29	22.67	7057
[illegible]	26408.51	0.0	26408.51	3559.91	0.0	3559.91	72.96	0.0	72.96	10762
[illegible]	61234.09	1355.73	62589.80	1272.11	120.38	1392.48	61.56	1.56	63.12	27943
[illegible]	32456.37	9701.04	42157.39	53.99	17.63	71.62	0.0	0.0	0.0	19704
[illegible]	76415.81	1274.38	77690.19	727.82	1.56	729.38	6.03	0.0	6.03	40658
32	207459.62	68633.69	276093.12	2916.89	804.58	3721.48	733.07	121.41	854.47	136994
33	199996.81	85479.31	285475.56	2905.76	1091.41	3997.17	2278.29	1464.77	3743.07	144672
34	375.20	5.95	381.15	0.0	0.0	0.0	74.72	0.0	74.72	225
35	40969.82	9399.56	50369.39	2874.81	225.84	3100.65	4.55	0.0	4.55	20087
36	71061.62	14131.57	85193.19	8503.60	1289.30	9792.91	111.55	0.0	111.55	14661
37	153759.12	202810.06	356569.06	100619.50	129412.19	230031.75	3942.06	6056.23	9998.30	22731
38	84009.62	30864.61	114874.31	2250.07	499.21	2749.28	381.43	136.49	517.92	71582
39	89503.06	5388.00	94891.06	5499.64	360.16	5859.81	92.19	12.62	104.80	43844
40	201739.25	65262.48	267001.75	10937.50	1711.90	12649.39	1995.63	140.47	2136.10	125985
41	63443.44	2418.80	65862.19	2151.65	84.08	2235.73	112.17	0.0	112.17	21053
42	49833.61	13622.05	63455.70	1583.88	404.15	1988.02	74.72	16.52	91.24	44491
43	272225.50	50186.73	322412.00	47353.87	12110.20	59464.06	7408.80	1356.83	8765.62	145874
44	48887.23	5654.17	54541.41	2939.94	167.52	3107.46	58.09	0.0	58.09	11702
45	175158.44	8612.87	183771.25	30929.58	2200.03	33129.60	4982.50	542.81	5525.31	74886
46	359684.81	25741.96	385426.94	7344.92	152.78	7497.80	22.98	0.0	22.98	158421
47	558083.56	191398.69	749482.19	19763.29	1836.33	21599.61	4500.12	908.70	5408.82	280216
48	45516.85	5097.94	50614.78	1856.36	6.85	1863.21	581.54	0.0	581.54	23048
49	1849.89	0.0	1849.89	38.68	0.0	38.68	0.0	0.0	0.0	422
50	367314.94	21907.29	389222.12	9416.99	396.97	9813.95	842.55	93.20	935.75	192224
51	317596.12	16917.37	334513.37	19280.81	344.46	19625.28	1569.10	10.42	1579.52	159221
52	13454.87	1716.13	15171.00	27.90	4.98	32.89	104.49	70.77	175.26	12253
53	14274.81	0.0	14274.81	164.98	0.0	164.98	8.27	0.0	8.27	7523
109	377944.81	14661.38	392606.19	42807.55	639.06	43446.61	4241.67	0.0	4241.67	134064
111	20586.38	720.26	21306.67	1077.39	0.0	1077.39	386.88	0.0	386.88	8890
129	60656.94	0.0	80656.94	1978.32	0.0	1978.32	23.39	0.0	23.39	34597
139	12581.23	1227.37	13808.61	2142.24	206.26	2348.50	74.89	2.92	77.81	6769
146	32920.88	2134.91	35055.76	16.65	1.67	18.32	0.0	0.0	0.0	13124
200	309575.62	682.56	310258.37	25121.10	0.0	25121.10	1896.44	0.0	1896.44	214519
201	1851201.00	510.54	1851711.00	419296.25	58.76	419354.56	54542.54	3.00	54545.54	1202333
202	1390622.00	348.84	1390971.00	63442.81	0.0	63442.81	5645.95	0.0	5645.95	651984
204	261159.81	81786.69	342946.25	79.00	69.62	148.62	54.64	1291.45	1346.08	182515
205	9223.51	702.88	9926.39	0.0	0.0	0.0	0.0	0.0	0.0	3208
206	1133.05	50.47	1183.52	0.0	0.0	0.0	0.0	0.0	0.0	1036
207	0.0	1056.43	1056.43	0.0	0.0	0.0	0.0	0.0	0.0	1383
210	1458.62	298.43	1757.05	111.31	0.0	111.31	0.0	0.0	0.0	873
220	793947.62	3858.31	797805.56	103930.00	381.58	104311.56	8625.55	24.42	8649.96	348069
221	566327.50	3860.59	570187.75	21448.56	25.82	21474.35	352.47	0.0	352.47	368124
222	167.80	3314.28	3482.07	50.19	647.92	698.11	0.0	341.73	341.73	1325
223	120068.50	241524.37	361592.56	9480.92	55107.41	64588.37	841.86	7888.01	8730.64	354402
224	384790.25	7879.91	392670.19	12023.26	16.67	12039.93	1077.02	38.70	1115.72	287700
225	312.80	0.0	312.80	0.0	0.0	0.0	0.0	0.0	0.0	277
254	10198261.0	7891333.00	16089648.0	948508.12	355409.12	1303919.00	117967.19	35847.64	153835.12	9095850

STANDING BIOMASS BY SLOPE CATEGORY

AND LAND OWNERSHIP

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

STANDING BIOMASS AND TOTAL PRODUCTION BY LAND OWNERSHIP
METRIC TONS PER GRAZING ALLOTMENT

GRAZING ALLOTMENT	PUBLIC STANDING BIOMASS	PRIVATE STANDING BIOMASS	TOTAL STANDING BIOMASS	PUBLIC TOTAL PRODUCTION	PRIVATE TOTAL PRODUCTION	COMBINED TOTAL PRODUCTION	TOTAL * PIXELS
1	573.43	0.0	573.43	88.93	0.0	88.93	208
2	21842.43	550.86	22393.28	3422.41	85.72	3508.13	8608
3	68366.00	7194.39	75560.37	10693.03	1095.01	11788.04	27095
4	141637.75	4849.91	146487.62	21350.05	771.74	22121.79	56767
5	33470.54	4695.17	38165.71	5126.25	726.29	5852.54	15311
6	22196.81	1505.12	23701.92	3475.04	238.70	3713.75	8745
7	11296.34	1665.53	12961.87	1835.04	271.68	2106.72	5334
8	139427.94	0.0	139427.94	20194.09	0.0	20194.09	38172
9	314165.19	25231.98	339397.06	49397.42	3867.90	53265.31	135714
10	19509.17	3438.52	22947.70	3108.53	537.79	3646.32	9023
11	56630.12	2442.11	59072.22	8555.69	376.09	8931.78	23156
12	7041.93	465.47	7507.39	934.80	59.48	994.28	2002
13	7231.32	1413.39	8644.71	1154.92	224.12	1379.04	4131
14	500826.56	387987.69	888813.56	73816.00	59099.31	132915.37	387870
15	22378.24	32479.74	54857.96	3687.47	5332.44	9019.92	27026
16	3010.14	656.75	3666.89	317.24	71.28	388.52	241
17	652944.62	465476.56	1118423.00	77196.81	50947.21	128144.12	136732
18	901.88	99.76	1001.64	127.37	13.91	141.28	269
19	432873.44	22079.96	454953.44	49523.34	2787.35	52310.73	61197
20	58174.70	2036.44	60211.12	8444.59	276.57	8721.16	32161
21	311833.56	373846.00	685680.12	33464.70	39607.05	73071.75	53176
22	5839.24	4806.54	10645.79	962.50	788.47	1750.97	5287
23	30181.32	10677.65	40858.97	4914.56	1738.20	6652.77	20439
24	12276.98	1360.91	13637.89	1737.75	194.55	1932.30	7060
25	16345.71	450.46	16796.18	2081.43	54.46	2135.89	3537
26	80726.37	79305.50	160031.87	12940.67	12709.23	25649.89	78288
27	6678.58	1713.64	8392.22	1142.84	291.71	1434.55	7057
28	30041.36	0.0	30041.36	4071.30	0.0	4071.30	10762
29	62567.74	1477.66	64045.37	9447.74	224.71	9672.45	27943
30	32510.35	9718.66	42228.99	4970.87	1474.62	6445.50	19704
31	77149.69	1275.94	78425.56	11868.09	197.98	12066.06	40658
32	211109.50	69559.69	280669.12	32201.10	10688.90	42889.98	136994
33	205180.75	88035.44	293215.69	31549.57	13492.61	45042.16	144672
34	449.92	5.95	455.88	68.64	0.92	69.56	225
35	43849.18	9625.40	53474.59	6016.57	1338.65	7355.23	20087
36	79676.75	15420.87	95097.62	9288.88	1651.84	10940.73	14661
37	258320.75	338278.37	596598.50	25989.93	34020.06	60009.98	22731
38	86641.12	31552.29	118193.50	12311.84	4482.20	16794.03	71582
39	95094.87	5760.78	100855.62	12966.86	775.89	13742.75	43844
40	214672.31	67114.81	281787.12	29603.05	9527.48	39130.51	125985
41	65707.19	2502.88	68210.06	8975.35	344.31	9319.66	21053
42	51492.22	14042.72	65534.94	7231.71	2010.24	9241.95	44491
43	326987.75	63653.74	390641.37	46416.91	8875.87	55292.72	195874
44	51885.25	5821.68	57706.96	6630.67	777.57	7408.24	11702
45	211070.50	11355.71	222426.25	27811.18	1448.96	29260.14	74886
46	367052.50	25894.94	392947.69	51006.06	3809.11	54815.20	158421
47	582347.25	194143.69	776491.00	81586.56	28013.13	109599.81	286216
48	47954.75	5104.79	53059.52	6572.39	721.18	7293.57	23048
49	1888.57	0.0	1888.57	252.79	0.0	252.79	422
50	377574.37	22397.44	399971.56	52746.01	3156.72	55903.29	192224
51	338445.81	17272.24	355718.12	45834.86	2362.92	48197.76	159221
52	13587.26	1791.88	15379.15	1891.72	243.12	2134.84	12253
53	14448.06	0.0	14448.06	1984.09	0.0	1984.09	7523
109	424994.00	15300.44	440294.12	64085.71	2411.56	66497.25	134064
111	22050.65	720.26	22770.91	3541.52	110.57	3652.10	8880
129	82658.62	0.0	82658.62	12117.82	0.0	12117.82	34597
139	14798.37	1436.55	16234.92	1988.11	193.68	2181.79	6769
146	32937.52	2136.58	35074.06	4826.20	317.83	5144.03	13124
200	336593.37	682.56	337275.87	51731.71	94.54	51826.24	214519
201	2325040.00	572.30	2325612.00	371730.94	91.08	371821.81	1202333
202	1459711.00	348.84	1460060.00	212974.31	56.84	213031.12	651984
204	261293.37	83147.69	344440.81	42109.01	13337.91	55446.89	182515
205	9223.51	702.88	9926.39	1258.53	108.81	1367.34	3208
206	1133.05	50.47	1183.52	147.95	6.21	154.16	1036
207	0.0	1056.43	1056.43	0.0	128.98	128.98	1383
210	1569.93	298.43	1868.37	245.52	45.52	291.04	873
220	906503.12	4264.30	910767.06	121456.44	577.12	122033.50	348069
221	588128.50	3886.41	592014.56	82022.56	533.60	82556.19	368124
222	217.99	4303.93	4521.91	25.98	545.02	571.00	1325
223	139391.25	304520.44	434910.94	17033.58	38406.22	55439.82	354402
224	397890.25	7935.29	405825.50	48735.95	956.13	49692.05	287700
225	312.80	0.0	312.80	38.83	0.0	38.83	277
254	11264753.0	8282595.00	19547392.0	1560636.00	1069410.00	2630051.00	9095850

STANDING BIOMASS AND TOTAL PRODUCTION

BY LAND OWNERSHIP

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

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STANDING BIOMASS AND TOTAL FORAGE PRODUCTION BY LAND OWNERSHIP
METRIC TONS PER GRAZING ALLOTMENT

GRAZING ALLOTMENT	PUBLIC STANDING BIOMASS	PRIVATE STANDING BIOMASS	TOTAL STANDING BIOMASS	PUBLIC TOTAL FORAGE PRODUCTION	PRIVATE TOTAL FORAGE PRODUCTION	COMBINED TOTAL FORAGE PRODUCTION	TOTAL PIXELS
1	573.43	0.0	573.43	71.77	0.0	71.77	208
2	21842.38	550.86	22393.23	2716.82	68.86	2785.68	8608
3	68366.00	7194.38	75560.31	8565.57	849.77	9415.34	27095
4	141637.37	4849.90	146487.19	15774.93	607.67	16382.59	56767
5	33470.43	4695.16	38165.58	4012.14	572.39	4584.52	15311
6	22196.78	1505.11	23701.89	2746.74	186.37	2933.11	8745
7	11296.32	1605.53	12901.85	1496.05	216.53	1682.58	5334
8	139427.87	0.0	139427.87	13757.31	0.0	13757.31	38192
9	314164.69	25231.93	339396.56	38482.59	2951.84	41434.43	135714
10	19509.15	3438.52	22947.66	2448.93	437.55	2886.48	9023
11	56630.02	2442.10	59072.09	6278.09	283.69	6561.78	23156
12	7041.93	465.47	7507.39	459.54	26.20	485.74	2002
13	7231.32	1413.39	8644.71	829.82	159.96	989.78	4131
14	500826.56	387987.69	888813.56	45515.60	39725.60	85241.19	387870
15	22378.24	32479.74	54857.96	2824.54	4057.41	6881.45	27028
16	3010.14	656.75	3666.89	21.93	15.41	67.34	241
17	652944.62	465476.56	1118423.00	25605.95	10829.56	36435.48	136732
18	901.88	99.76	1001.64	72.02	7.72	79.74	269
19	432873.44	22079.96	454953.44	13715.41	1199.70	14915.11	61197
20	58174.70	2036.44	60211.12	6266.01	191.47	6457.48	32161
21	311833.56	373946.00	685680.12	5548.20	5828.29	11376.50	53176
22	5839.24	4806.54	10645.79	743.12	604.70	1347.82	5287
23	30181.32	10677.65	40858.97	3718.58	1312.43	5031.01	20439
24	12276.98	1360.91	13637.89	1226.45	136.47	1362.92	7060
25	16345.71	450.46	16796.18	918.23	20.16	938.39	3537
26	80726.37	79305.50	160031.87	9432.62	9300.34	18732.96	78288
27	6678.58	1713.64	8392.22	936.17	237.17	1173.34	7057
28	30041.36	0.0	30041.36	2093.16	0.0	2093.16	10762
29	62567.74	1477.66	64045.37	6039.51	146.13	6184.64	27943
30	32510.35	9716.66	42226.99	3241.61	950.52	4192.12	19704
31	77149.69	1275.94	78425.56	7911.01	134.02	8045.03	40658
32	211109.50	69559.69	280669.12	21172.83	7130.85	28303.68	136994
33	205180.75	88035.44	293215.69	21021.92	8947.62	29969.54	144672
34	449.92	5.95	455.88	43.60	0.62	44.22	225
35	43849.18	9625.40	53474.59	3319.20	757.65	4076.85	20087
36	79676.75	15420.87	95097.62	2944.44	316.25	3260.69	14661
37	258320.75	338278.37	596598.50	1421.63	1767.17	3188.80	22731
38	86641.12	31552.29	118193.50	8446.14	3103.52	11549.67	71562
39	95094.87	5760.78	100855.62	9093.00	530.18	9623.19	43844
40	214672.31	67114.81	281737.12	20639.87	6975.89	27615.76	125985
41	65707.19	2502.88	68210.06	6290.73	242.75	6533.48	21053
42	51492.22	14042.72	65534.94	4736.61	1323.00	6059.62	44491
43	326987.75	63653.74	390641.37	31713.68	5939.16	37652.80	195874
44	51885.25	5821.68	57706.96	3896.59	506.37	4402.95	11702
45	211070.50	11355.71	222426.25	17946.97	870.83	18817.79	74886
46	367052.50	25894.94	392947.69	35963.20	2970.43	38933.60	158421
47	582347.25	194143.69	776491.00	58528.93	20915.98	79444.94	286216
48	47954.75	5104.79	53059.52	4642.64	538.22	5180.87	23046
49	1888.57	0.0	1888.57	166.29	0.0	166.29	422
50	377574.37	22397.44	399971.56	37713.73	2272.09	39985.80	192224
51	338445.81	17272.24	355718.12	30833.70	1623.35	32457.05	159221
52	13587.26	1791.88	15379.15	1225.53	157.30	1382.83	12253
53	14448.06	0.0	14448.06	1343.41	0.0	1343.41	7523
109	424994.00	15300.44	440294.12	47013.98	1885.17	48899.13	134064
111	22050.62	720.26	22770.88	2823.13	82.82	2905.95	8880
129	82658.69	0.0	82658.69	7205.43	0.0	7205.43	34597
139	14798.37	1436.55	16234.92	1322.91	131.48	1454.40	6769
146	32937.52	2136.58	35074.06	3815.54	256.38	4071.92	13124
200	336592.62	662.56	337275.12	38667.89	63.03	38730.91	214519
201	2325034.00	572.30	2325606.00	290895.31	71.61	290967.00	1202333
202	1459712.00	348.84	1460060.00	130856.00	42.43	130898.44	651984
204	261293.37	83147.69	344440.81	31051.36	9675.27	40726.64	182515
205	9223.51	702.88	9926.39	692.32	73.20	765.52	3208
206	1133.05	50.47	1183.52	80.96	3.05	84.00	1036
207	0.0	1056.43	1056.43	0.0	76.20	76.20	1383
210	1569.93	298.43	1868.37	169.52	28.95	198.47	873
220	906502.62	4264.30	910766.92	79348.27	384.21	79732.56	348064
221	588128.50	3886.41	592014.56	56379.47	370.77	56750.22	368124
222	217.99	4303.93	4521.91	12.68	323.99	336.66	1325
223	130391.00	304520.19	434910.44	9332.60	18866.16	28198.72	354402
224	397890.25	7935.29	405825.50	21859.18	419.15	22278.34	287700
225	312.80	0.0	312.80	19.31	0.0	19.31	277
254	11264745.0	8282640.00	19547392.0	996714.44	540038.37	1536756.00	9095850

STANDING BIOMASS AND TOTAL FORAGE PRODUCTION
BY LAND OWNERSHIP

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

STANDING BIOMASS AND RENEWABLE FORAGE
PRODUCTION BY LAND OWNERSHIP
METRIC TONS PER GRAZING ALLOTMENT

GRAZING ALLOTMENT	PUBLIC STANDING BIOMASS	PRIVATE STANDING BIOMASS	TOTAL STANDING BIOMASS	PUBLIC RENEWABLE FORAGE PRODUCTION	PRIVATE RENEWABLE FORAGE PRODUCTION	COMBINED RENEWABLE FORAGE PRODUCTION	TOTAL PIXELS
1	573.43	0.0	573.43	13.49	0.0	13.49	208
2	21842.43	550.86	22393.28	599.51	12.72	612.22	8608
3	68366.00	7194.39	75560.37	1955.37	184.23	2139.60	27095
4	141637.75	4849.91	146487.62	3490.77	146.66	3637.42	56707
5	33470.54	4695.17	38165.71	809.38	112.47	921.85	15311
6	22196.81	1505.12	23701.92	593.48	40.64	634.13	8745
7	11296.34	1665.53	12961.87	344.33	52.25	396.58	5334
8	139427.94	0.0	139427.94	3323.06	0.0	3323.06	38192
9	314165.19	25231.98	339397.06	8476.55	573.11	9049.66	135714
10	19509.17	3438.52	22947.70	520.31	87.37	607.68	9023
11	56630.12	2442.11	59072.22	1319.12	54.01	1373.13	23156
12	7041.93	465.47	7507.39	79.66	4.50	84.16	2002
13	7231.32	1413.39	8644.71	144.09	27.45	171.55	4131
14	500826.56	387987.69	888813.56	7816.42	6845.37	14661.80	387670
15	22376.24	32479.74	54857.96	463.68	669.81	1133.49	27028
16	3010.14	656.75	3666.89	8.44	2.60	11.04	241
17	652944.62	465476.56	1118423.00	4447.50	1819.20	6266.70	136732
18	901.88	99.76	1001.64	13.33	1.43	14.75	269
19	432873.44	22079.96	454953.44	2348.64	207.47	2556.11	61197
20	58174.70	2036.44	60211.12	1002.19	27.52	1029.70	32161
21	311833.56	373846.00	685680.12	952.24	974.11	1926.35	53176
22	5839.24	4806.54	10645.79	121.75	99.02	220.77	5287
23	30181.32	10677.65	40858.97	622.04	221.52	843.55	20439
24	12276.98	1360.91	13637.89	189.13	22.40	211.52	7060
25	16345.71	450.46	16796.18	160.05	3.42	163.47	3537
26	80726.37	79305.50	160031.87	1576.94	1561.15	3138.08	78288
27	6678.58	1713.64	8392.22	138.62	35.30	173.92	7057
28	30041.36	0.0	30041.36	349.34	0.0	349.34	10762
29	62567.74	1477.66	64045.37	1087.17	26.08	1113.25	27943
30	32510.35	9718.66	42228.99	586.66	169.86	756.52	19704
31	77149.69	1275.94	78425.56	1391.06	24.19	1415.24	40658
32	211109.50	69559.69	280669.12	3675.54	1242.76	4918.30	136994
33	205180.75	88035.44	293215.69	3659.83	1563.19	5223.02	144672
34	449.92	5.95	455.88	8.11	0.12	8.22	225
35	43849.18	9625.40	53474.59	539.71	122.50	662.21	20087
36	79676.75	15420.87	95097.62	495.46	52.30	547.76	14661
37	258320.75	338278.37	596598.50	201.51	258.65	460.16	22731
38	86641.12	31552.29	118193.50	1289.35	470.86	1760.21	71582
39	95094.87	5760.78	100855.62	1316.41	80.12	1396.53	43844
40	214672.31	67114.81	281787.12	3378.36	1099.03	4477.39	125985
41	65707.19	2502.88	68210.06	1076.81	41.92	1118.73	21053
42	51492.22	14042.72	65534.94	686.14	200.17	886.31	44491
43	326987.75	63653.74	390641.37	5248.66	1002.89	6251.55	195874
44	51885.25	5821.68	57706.96	728.26	95.89	824.15	11762
45	211070.50	11355.71	222426.25	2735.20	133.79	2868.99	74886
46	367052.50	25894.94	392947.69	5952.80	512.28	6465.07	158421
47	582347.25	194143.69	776491.00	10028.17	3738.23	13766.41	286216
48	47954.75	5104.79	53059.52	675.98	77.37	753.36	23048
49	1888.57	0.0	1888.57	31.29	0.0	31.29	422
50	377574.37	22397.44	399971.56	5709.79	350.49	6060.28	192224
51	338445.81	17272.24	355718.12	4386.19	228.20	4614.39	159221
52	13587.26	1791.88	15379.15	160.25	19.10	179.35	12253
53	14448.06	0.0	14448.06	181.34	0.0	181.34	7523
109	424994.00	15300.44	440294.12	11313.63	457.66	11771.29	134064
111	22050.65	720.26	22770.91	632.64	14.95	647.56	8800
129	82658.62	0.0	82658.62	1288.87	0.0	1288.87	34597
139	14798.37	1436.55	16234.92	188.98	17.98	206.96	6769
146	32937.52	2136.58	35074.06	660.68	45.95	706.63	13124
200	336593.37	682.56	337275.87	8324.46	8.91	8333.37	214519
201	2325040.00	572.30	2325612.00	65177.15	15.08	65192.24	1202333
202	1459711.00	348.84	1460060.00	22038.81	6.67	22045.48	651984
204	261293.37	83147.69	344440.81	5249.59	1612.54	6862.13	182515
205	9223.51	702.88	9926.39	117.80	13.49	131.29	3208
206	1133.05	50.47	1183.52	8.18	0.24	8.42	1036
207	0.0	1056.43	1056.43	0.0	4.31	4.31	1383
210	1569.93	298.43	1868.37	30.33	5.37	35.70	873
220	906498.50	4264.30	910762.75	12805.93	58.10	12864.03	348069
221	588128.25	3886.41	592014.31	8042.64	50.12	8092.75	368124
222	217.99	4303.91	4521.90	2.27	57.23	59.50	1325
223	130391.25	304520.44	434910.94	976.81	1851.89	2828.70	354402
224	397890.25	7935.29	405825.50	1760.04	32.12	1792.16	287700
225	312.80	0.0	312.80	1.58	0.0	1.58	277
254	11264749.0	8282591.00	19547392.0	159066.12	83480.12	242546.81	9095850

STANDING BIOMASS AND RENEWABLE FORAGE

PRODUCTION BY LAND OWNERSHIP

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

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TOTAL PRODUCTION BY SLOPE CATEGORY AND LAND OWNERSHIP
BIOMASS IN METRIC TONS

GRAZING ALLOTMENT	PUBLIC 0-25PCT SLOPE	PRIVATE 0-25 SLOPE	TOTAL 0-25PCT SLOPE	PUBLIC 26-50PCT SLOPE	PRIVATE 26-50PCT SLOPE	TOTAL 26-50PCT SLOPE	PUBLIC GT50PCT SLOPE	PRIVATE GT50PCT SLOPE	TOTAL GT50PCT SLOPE	PIXELS
1	37836.23	0.0	37836.23	0.0	0.0	0.0	0.0	0.0	0.0	208
2	1188638.00	32134.87	1197412.00	28663.05	518.30	28663.05	62005.76	0.0	62005.76	8608
3	3595165.00	369551.00	3875360.00	886214.81	18145.65	892064.37	89496.81	8782.80	91253.69	27095
4	7804540.00	379639.19	8184179.00	544013.06	3702.92	545767.94	25179.88	0.0	25179.88	56767
5	1170331.00	153936.37	1324267.00	295951.81	64788.03	360739.81	15793.93	3109.83	17622.35	15311
6	1137747.00	100028.12	1237775.00	157354.25	10037.49	162033.87	0.0	0.0	0.0	8745
7	537578.50	92423.69	630002.19	24568.33	8774.40	33342.73	0.0	289.36	289.36	5334
8	10490093.0	0.0	10490093.0	1275212.00	0.0	1275212.00	78384.62	0.0	78384.62	38192
9	15055703.0	847945.44	15691554.0	1913990.00	77214.69	1991204.00	54986.27	7256.26	57911.07	135714
10	846195.12	249304.37	916112.00	8811.18	518.30	9329.48	15922.57	8789.76	20775.32	9023
11	1634858.00	104891.31	1703975.00	398357.75	518.30	398357.75	155411.12	0.0	155411.12	23156
12	321614.87	21138.30	335714.87	623.96	671.43	694.72	0.0	0.0	0.0	2002
13	463247.94	60753.83	524001.75	0.0	0.0	0.0	0.0	0.0	0.0	4131
14	11073607.0	16570605.0	26962272.0	645531.12	29521.35	674749.50	21138.30	2976.45	21138.30	387870
15	1273891.00	1749630.00	3023431.00	0.0	0.0	0.0	0.0	0.0	0.0	27028
16	159350.19	37398.53	196748.69	16260.23	4463.80	17886.25	0.0	0.0	0.0	241
17	12191912.0	13369084.0	25180288.0	3325532.00	1238791.00	4562004.00	120522.62	75884.56	196407.19	136732
18	62442.98	5371.44	67814.37	5371.44	3357.15	8728.58	0.0	528.02	528.02	269
19	5209296.00	328514.44	5240502.00	4910180.00	276755.69	5178008.00	1263254.00	6504.09	1267717.00	61197
20	1580424.00	81606.94	1662030.00	477231.25	30490.51	496904.31	75519.25	1793.56	76786.44	32161
21	14190426.0	14525210.0	26715632.0	2745237.00	4548614.00	7293851.00	52032.71	44636.00	80346.37	53176
22	437707.31	447378.69	885086.00	0.0	0.0	0.0	0.0	0.0	0.0	5287
23	2683023.00	845776.37	3528799.00	0.0	0.0	0.0	0.0	0.0	0.0	20439
24	607717.67	37066.89	644784.56	1269.23	656.08	1903.85	0.0	0.0	0.0	7060
25	595124.37	19512.27	614636.62	115447.62	9756.14	125203.75	3252.04	0.0	3252.04	3537
26	3453925.00	4125928.00	7579853.00	21056.73	28305.77	49362.49	40719.63	30211.34	70930.94	78288
27	471945.62	114248.37	586194.00	0.0	0.0	0.0	2300.30	1150.15	3450.46	7057
28	858539.81	0.0	858539.81	208130.94	0.0	208130.94	3252.04	0.0	3252.04	10762
29	3059438.00	76632.62	3136070.00	50398.07	5172.34	54195.18	3252.04	231.57	3252.04	27943
30	2037669.00	491899.00	2529568.00	1822.31	1457.84	3280.15	0.0	0.0	0.0	19704
31	3682166.00	85262.44	3767428.00	26576.93	231.57	26576.93	369.45	0.0	369.45	40658
32	6247979.00	2305883.00	8553862.00	108943.44	25889.59	131707.75	30722.11	8209.60	34174.03	136994
33	7659470.00	3641085.00	11300555.0	82927.12	28868.04	107317.44	124269.12	59373.06	183642.12	144672
34	23473.67	690.38	24163.45	0.0	0.0	0.0	4433.43	0.0	4433.43	225
35	1791691.00	410018.75	2201709.00	159350.19	13849.52	167480.25	364.46	0.0	364.46	20087
36	4489449.00	959353.00	5448802.00	643905.12	69918.94	713824.06	6504.09	0.0	6504.09	14661
37	7463476.00	11262165.0	18725632.0	5253894.00	6450193.00	11704087.0	245509.06	339246.94	495481.94	22731
38	2514703.00	871102.12	3385805.00	56388.45	16490.96	70540.62	14148.34	10665.68	24814.02	71582
39	3923997.00	208326.44	4132323.00	233538.62	11423.09	244961.69	3807.70	1014.91	3807.70	43844
40	6083714.00	2710150.00	8793864.00	673962.12	98365.44	772327.56	99000.00	5762.95	99000.00	125985
41	2826579.00	112639.50	2908444.00	114865.50	6286.86	116769.31	5076.93	0.0	5076.93	21053
42	2212365.00	842370.50	3054735.00	88132.87	16620.59	104753.44	5904.68	1093.46	6998.14	44491
43	7454336.00	854559.75	8078794.00	1997770.00	384577.31	2382347.00	257019.37	43813.21	289384.75	195874
44	2278906.00	340014.25	2514348.00	157384.75	11026.98	160557.61	5076.93	0.0	5076.93	11702
45	7168855.00	299225.44	7468080.00	1509115.00	116134.69	1625249.00	135807.75	17769.25	153576.94	74886
46	12314922.0	1033178.94	13348100.0	274788.69	10153.86	284942.50	1353.21	0.0	1353.21	158421
47	19019824.0	9487392.00	28507216.0	804692.56	88846.12	893538.69	160355.81	34506.96	194862.75	286216
48	1774128.00	164262.06	1914025.00	149769.25	634.62	150403.81	30461.56	0.0	30461.56	23048
49	118926.37	0.0	118926.37	3021.60	0.0	3021.60	0.0	0.0	0.0	422
50	11400156.0	638040.75	12038196.0	342058.00	13621.56	345231.06	42445.02	6530.00	48975.02	192224
51	15018062.0	683925.75	15901987.0	725184.25	11809.37	726695.00	101223.62	1014.91	101223.62	159221
52	744762.94	90062.12	834333.94	2796.96	395.83	2796.96	9425.62	6437.01	15862.62	12253
53	873463.37	0.0	873463.37	9622.45	0.0	9622.45	896.78	0.0	896.78	7523
109	29524688.0	1217301.00	30741984.0	3138896.00	68440.31	3207336.00	264987.00	0.0	264987.00	134064
111	799055.75	35818.31	801395.56	78969.62	0.0	78969.62	18144.32	0.0	18144.32	8880
129	4261271.00	0.0	4261271.00	53570.67	0.0	53570.67	1457.84	0.0	1457.84	34597
139	779002.44	71742.31	850744.75	82503.69	8668.87	91172.50	3280.38	408.61	3280.38	6769
146	2128625.00	189129.62	2317754.00	2619.52	218.69	2619.52	0.0	0.0	0.0	13124
200	7444357.00	29320.33	7444357.00	1122538.00	0.0	1122538.00	92423.69	0.0	92423.69	214519
201	103091936.	29623.38	103121552.	17450672.0	6655.26	17457312.0	2557044.00	578.72	2558222.00	1202333
202	29594392.0	18402.43	29605392.0	2344724.00	0.0	2344724.00	184417.25	0.0	184417.25	651984
204	12860822.0	4302820.00	17163632.0	4832.69	6903.84	11736.53	3612.22	126340.31	129792.19	182515
205	242670.12	50052.87	292723.00	0.0	0.0	0.0	0.0	0.0	0.0	3208
206	71903.50	4958.97	76862.31	0.0	0.0	0.0	0.0	0.0	0.0	1036
207	0.0	83515.31	83515.31	0.0	0.0	0.0	0.0	0.0	0.0	1383
210	117020.12	18295.19	135315.31	5254.14	0.0	5254.14	0.0	0.0	0.0	873
220	19434176.0	99860.25	19534032.0	3481835.00	20602.12	3485627.00	285676.06	817.22	286308.06	348069
221	18019936.0	123222.69	18143152.0	801548.75	1398.46	801811.19	13122.93	0.0	13122.93	368124
222	13904.59	307165.12	321069.69	2757.24	57514.43	60042.54	0.0	32865.41	32865.41	1325
223	3762986.00	4744715.00	8860559.00	256220.50	1700200.00	1956420.00	14960.25	244420.87	259381.06	354402
224	15928497.0	487498.94	16415995.0	502325.69	1001.25	502325.69	65481.73	4405.50	69887.19	287700
225	28237.99	0.0	28237.99	0.0	0.0	0.0	0.0	0.0	0.0	277
254	135103680.	143712752.	192275504.	11541851.0	6535002.00	13322002.0	1565352.00	350142.87	1568861.00	9095850

TOTAL PRODUCTION BY SLOPE CATEGORY AND LAND OWNERSHIP

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

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TOTAL FORAGE PRODUCTION BY SLOPE CATEGORY AND LAND OWNERSHIP
BIOMASS IN METRIC TONS

GRAZING ALLOTMENT	PUBLIC 0-25PCT SLOPE	PRIVATE 0-25 SLOPE	TOTAL 0-25PCT SLOPE	PUBLIC 26-50PCT SLOPE	PRIVATE 26-50PCT SLOPE	TOTAL 26-50PCT SLOPE	PUBLIC GT50PCT SLOPE	PRIVATE GT50PCT SLOPE	TOTAL GT50PCT SLOPE	PIXELS
1	34133.71	0.0	34133.71	0.0	0.0	0.0	0.0	0.0	0.0	208
2	903941.37	28990.27	915213.19	21262.59	467.58	21262.59	45996.61	0.0	45996.61	6608
3	2666935.00	333388.06	2874787.00	657404.44	16365.47	661743.69	66341.31	6326.28	68734.94	27095
4	5789499.00	281620.81	5071119.00	403555.25	3131.07	404857.60	21291.31	0.0	21291.31	56767
5	1055806.00	138872.69	1194678.00	266991.36	58448.12	325439.12	13092.36	2805.51	15897.89	15311
6	843994.31	74202.06	918196.37	116727.25	7232.32	120198.69	0.0	0.0	0.0	8745
7	398782.00	68560.94	467342.94	18225.07	6508.95	24734.03	0.0	263.57	263.57	5334
8	7781673.00	0.0	7781673.00	945968.00	0.0	945968.00	58146.66	0.0	58146.66	38192
9	11168500.0	764968.94	11640182.0	1419819.00	57278.78	1477097.00	40789.46	6540.19	42959.11	135714
10	648327.12	224908.31	817806.00	7948.94	467.58	8416.52	13463.62	6053.54	16907.80	9023
11	1252575.00	72238.81	1305530.00	332452.81	467.58	332920.37	93984.50	0.0	93984.50	23156
12	162645.94	7130.61	169776.50	457.65	339.55	480.56	0.0	0.0	0.0	2002
13	322456.62	44251.40	366746.00	0.0	0.0	0.0	0.0	0.0	0.0	4131
14	7233409.00	11534433.0	18767840.0	391964.25	19843.19	411807.44	13473.77	1916.58	13473.77	387870
15	1053074.00	1446450.00	2499524.00	0.0	0.0	0.0	0.0	0.0	0.0	27028
16	26358.98	6186.29	32545.27	2689.69	339.55	2958.66	0.0	0.0	0.0	241
17	5700078.00	3003686.00	8703764.00	867558.00	180981.81	1048539.81	16298.55	3395.53	19694.08	136732
18	31578.45	2716.43	34294.87	2716.43	1697.77	4414.19	0.0	360.72	360.72	269
19	1570092.00	240950.69	1705234.00	1048539.75	38596.93	1086909.00	192187.06	2376.87	194563.87	61197
20	1042628.81	53837.28	1096466.00	262885.50	20115.03	273722.50	41600.23	1183.24	42299.39	32161
21	659810.75	802603.75	1394604.00	260097.69	160370.62	413236.12	11544.80	5093.30	16638.10	53176
22	321038.81	328132.31	649171.12	0.0	0.0	0.0	0.0	0.0	0.0	5287
23	1967878.00	620339.50	2588217.00	0.0	0.0	0.0	0.0	0.0	0.0	20439
24	400920.12	25476.60	425373.69	699.16	372.58	1048.75	0.0	0.0	0.0	7060
25	274019.44	3227.63	276396.25	43123.23	1613.81	44141.88	537.94	0.0	537.94	3537
26	2533299.00	3026185.00	5559484.00	14657.12	19703.02	34360.14	33663.65	24976.25	58639.90	78288
27	425436.44	102989.44	528425.87	0.0	0.0	0.0	2073.61	1036.81	3110.42	7057
28	506796.31	0.0	506796.31	48922.82	0.0	48922.82	1779.01	0.0	1779.01	10762
29	2129607.00	53342.30	2182949.00	35080.98	2993.06	37724.07	1661.96	139.95	1681.96	27943
30	1418576.00	342400.00	1760776.00	1224.89	979.91	2204.80	0.0	0.0	0.0	19704
31	2563073.00	59349.32	2622422.00	17048.22	139.93	17048.22	222.36	0.0	222.36	40658
32	4349079.00	1605073.00	5954152.00	46294.74	16607.31	62902.05	21364.98	6787.02	23767.79	136994
33	5331586.00	2534479.00	7866065.00	40416.04	18517.89	58933.93	86501.00	41326.27	127829.25	144672
34	16339.08	480.56	16819.64	0.0	0.0	0.0	2883.37	0.0	2883.37	225
35	1204309.00	275599.81	1479908.00	75943.06	9309.15	85252.19	244.98	0.0	244.98	20087
36	742623.56	158691.75	901315.31	106511.75	11565.67	118077.37	1334.26	0.0	1334.26	14661
37	263140.06	397070.81	660210.87	185236.75	227414.69	412651.44	8655.92	11900.91	17469.22	22731
[illegible]	1667412.00	577598.00	2245010.00	47355.31	10846.34	56620.48	9381.27	7072.04	16453.31	71582
[illegible]	2683179.00	142451.00	2825630.00	128646.06	7359.91	134938.50	2204.59	849.22	3113.81	43844
[illegible]	5090507.00	2267699.00	7358206.00	371255.81	54185.16	425440.94	56035.38	4919.28	59869.86	125965
[illegible]	1821028.00	96149.56	1917177.00	88099.87	5366.49	93466.31	4024.87	0.0	4024.87	21053
42	1466942.00	558546.75	2025488.00	50049.91	9438.70	59488.61	3353.22	620.97	3974.19	44491
43	6142247.00	583605.81	6656790.00	1100482.00	211846.50	1312328.00	141580.56	17826.67	159409.19	195874
44	1850992.00	290237.69	2141229.00	86696.25	4024.87	89441.37	2796.65	0.0	2796.65	11702
45	4729396.00	197403.31	4926799.00	831305.31	63973.45	895278.75	74810.44	9788.29	84598.69	74866
46	10304435.0	864505.62	11168940.0	151368.87	5593.31	156962.12	1132.29	0.0	1132.29	158421
47	16235417.0	8098480.00	24333888.0	443269.69	48941.41	492211.06	134176.69	28873.47	163050.12	286216
48	1170418.00	137948.06	1262710.00	82501.19	349.58	82850.75	20708.73	0.0	20708.73	23048
49	101516.06	0.0	101516.06	699.16	0.0	699.16	0.0	0.0	0.0	422
50	9539004.00	533876.31	10072880.0	188424.56	11627.39	190172.44	28143.83	5245.57	32473.64	192224
51	9907637.00	583138.56	10490775.0	357622.19	6706.44	363565.06	17348.16	849.22	17348.16	159221
52	504377.69	52331.29	540299.31	1625.20	281.75	1625.20	6267.11	4279.98	10547.09	12253
53	576236.37	0.0	576236.37	5464.51	0.0	5464.51	591.62	0.0	591.62	7523
109	21901760.0	903008.75	22804768.0	2328470.00	50769.85	2379239.00	196570.44	0.0	196570.44	134004
111	592748.81	24635.44	594484.50	58580.60	0.0	58580.60	15342.27	0.0	15342.27	6880
129	2465853.00	0.0	2465853.00	30999.55	0.0	30999.55	979.91	0.0	979.91	34597
139	513919.25	47329.48	561248.69	54428.90	5718.98	60147.87	1862.90	343.15	1862.90	6709
146	1817004.00	161441.87	1978445.00	2236.04	124.19	2236.04	0.0	0.0	0.0	13124
200	6696880.00	20028.60	6696880.00	832712.37	0.0	832712.37	68560.94	0.0	68560.94	214519
201	87171296.0	25048.60	87196336.0	15895599.0	6062.19	15901661.0	2329726.00	527.15	2330253.00	1202333
202	20599968.0	16588.91	20607648.0	1264819.00	0.0	1264819.00	123958.69	0.0	123958.69	651984
204	8952138.00	2995097.00	11947235.0	3363.93	4805.61	8169.54	2966.29	87942.69	90345.44	182515
205	168917.31	34840.70	203758.00	0.0	0.0	0.0	0.0	0.0	0.0	3208
206	32158.59	2217.83	34376.42	0.0	0.0	0.0	0.0	0.0	0.0	1036
207	0.0	51365.20	51365.20	0.0	0.0	0.0	0.0	0.0	0.0	1383
210	81455.12	12734.87	94190.00	4343.70	0.0	4343.70	0.0	0.0	0.0	873
220	13588848.0	64519.98	13609856.0	1917971.00	17186.55	1920059.00	178882.87	686.31	178882.87	348069
221	11981493.0	81931.00	12063424.0	526864.12	1126.99	527036.62	8625.80	0.0	8625.80	366124
222	7659.36	164202.19	176861.50	1392.61	31681.84	33074.50	0.0	18103.94	18103.94	1325
223	2405322.00	2043610.00	4388824.00	111663.37	597774.56	687859.25	7198.67	87403.50	94432.00	354402
224	6623889.00	202727.06	6826616.00	205967.31	449.07	205967.31	29369.33	1975.92	31345.25	287700
225	12629.33	0.0	12629.33	0.0	0.0	0.0	0.0	0.0	0.0	277
254	89129840.0	50051392.0	96102912.0	8561879.00	2002573.00	8642156.00	1161196.00	250035.94	1163799.00	9095850

TOTAL FORAGE PRODUCTION BY SLOPE CATEGORY

AND LAND OWNERSHIP

BUREAU OF LAND MANAGEMENT
CALIFORNIA DESERT CONSERVATION AREA

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RENEWABLE FORAGE PRODUCTION BY SLOPE CATEGORY AND LAND OWNERSHIP
BIOMASS IN METRIC TONS

GRAZING ALLOTMENT	PUBLIC 0-25PCT SLOPE	PRIVATE 0-25 SLOPE	TOTAL 0-25PCT SLOPE	PUBLIC 26-50PCT SLOPE	PRIVATE 26-50PCT SLOPE	TOTAL 26-50PCT SLOPE	PUBLIC GT50PCT SLOPE	PRIVATE GT50PCT SLOPE	TOTAL GT50PCT SLOPE	PIXELS
1	6862.39	0.0	6862.39	0.0	0.0	0.0	0.0	0.0	0.0	208
2	229535.00	5828.33	231229.37	5535.04	99.01	5535.04	11973.76	0.0	11973.76	6508
3	694253.12	67025.75	748361.00	171134.56	3290.19	172264.12	17262.90	1222.07	17621.78	27095
4	1507114.00	73311.12	1580425.00	105052.87	666.88	105394.75	4534.79	0.0	4534.79	56767
5	217787.19	28014.12	245801.25	53677.04	11750.66	65427.70	3049.92	564.03	3196.16	15311
6	219707.50	19316.19	239023.69	30386.29	903.66	31289.96	0.0	0.0	0.0	8745
7	103810.37	17847.71	121658.06	4744.32	1694.40	6438.73	0.0	70.56	70.56	5339
8	2025714.00	0.0	2025714.00	246253.12	0.0	246253.12	15136.66	0.0	15136.66	38192
9	2907368.00	153792.69	3030155.00	369605.62	14910.74	384516.31	10616.25	1316.67	11183.05	135714
10	162132.69	45216.57	175523.87	1598.09	94.01	1692.10	2936.96	1146.25	3980.59	9023
11	313242.25	13243.14	326485.37	76925.81	94.01	76925.81	19429.14	0.0	19429.14	23156
12	30141.81	1321.46	31463.27	78.47	62.93	91.12	0.0	0.0	0.0	2002
13	61142.66	8018.70	69161.31	0.0	0.0	0.0	0.0	0.0	0.0	4131
14	1371563.00	2187102.00	3558665.00	62931.63	3185.91	66117.50	2163.28	312.47	2163.28	38787
15	166787.87	229091.56	395879.44	0.0	0.0	0.0	0.0	0.0	0.0	27028
16	4138.41	1006.82	5109.67	422.29	62.93	464.52	0.0	0.0	0.0	241
17	1056346.00	556648.12	1612994.00	160777.25	33539.85	194317.06	3020.47	629.27	3649.74	136732
18	5852.16	503.41	6355.57	503.41	314.63	818.04	0.0	66.16	66.16	269
19	293972.25	41315.68	316017.00	194317.06	7110.70	201427.75	35616.42	440.49	36056.91	61197
20	147895.81	6808.59	153614.94	47952.02	2543.87	49926.76	7568.15	177.57	7715.68	32161
21	125110.12	138564.19	256614.37	48201.73	28379.67	76581.56	2139.50	943.90	3083.40	53176
22	55048.31	56264.63	111312.94	0.0	0.0	0.0	0.0	0.0	0.0	5287
23	337430.94	106369.19	443800.12	0.0	0.0	0.0	0.0	0.0	0.0	20439
24	50702.85	5181.96	53795.39	127.53	63.77	191.30	0.0	0.0	0.0	7060
25	50781.71	506.74	51222.19	7991.67	253.37	8160.45	84.46	0.0	84.46	3537
26	434383.44	518898.19	953281.62	2779.21	3735.99	6515.20	5331.71	3955.78	9287.49	78288
27	52835.42	12790.38	65625.75	0.0	0.0	0.0	257.52	126.76	384.29	7057
28	79634.56	0.0	79634.56	7687.41	0.0	7687.41	279.54	0.0	279.54	10762
[illegible]	403605.37	10114.51	413920.37	6651.86	565.54	7153.05	318.93	24.63	318.93	27943
[illegible]	268945.75	64924.20	333869.94	196.66	157.33	353.99	0.0	0.0	0.0	19704
[illegible]	485997.69	11253.53	497251.19	2788.22	24.63	2768.22	40.46	0.0	40.40	40658
32	824651.37	304346.50	1128997.00	7571.46	2716.11	10287.57	4054.92	1074.94	4510.52	136994
33	1010949.87	480575.87	1491525.00	6610.00	3028.58	9638.58	16401.90	7836.46	24238.36	144672
34	3098.14	91.12	3189.26	0.0	0.0	0.0	546.73	0.0	546.73	225
35	193357.44	44248.79	237606.19	12193.00	1494.63	13687.63	39.33	0.0	39.33	20087
36	116593.44	24914.94	141508.37	16722.57	1824.67	18538.40	209.66	0.0	209.66	14661
37	39524.57	59641.41	99165.94	27823.21	34158.49	61981.71	1300.15	1796.57	2625.94	42731
38	272214.06	94295.87	366509.94	6923.21	1371.70	8277.75	1531.54	1154.55	2686.09	71582
39	307716.69	17408.11	324053.44	23465.88	1151.93	24613.00	382.60	132.91	487.35	43844
40	796734.50	354926.44	1151660.00	67719.44	9683.72	77603.12	9947.49	976.61	10121.23	125985
41	361523.56	19088.30	380611.81	17490.21	1065.39	18555.60	799.05	0.0	799.05	21053
42	239486.19	91185.69	330671.87	6941.55	1309.08	8250.62	465.07	95.34	561.19	44491
43	1066462.00	115861.50	1155800.00	200735.25	38642.16	239377.37	25825.22	3252.06	29077.28	195874
44	367472.00	57620.04	425092.00	16957.52	799.05	17756.56	510.13	0.0	510.13	11702
45	598109.06	29778.71	623073.87	151635.44	11669.17	163304.56	13645.91	1785.45	15431.36	74886
46	1612786.00	168687.31	1748093.00	27610.67	1029.26	28639.92	177.57	0.0	177.57	158421
47	3223169.00	1607767.00	4830936.00	80855.19	8927.23	89782.37	21000.51	4519.10	25519.61	286216
48	148018.31	20167.62	159690.19	15048.77	63.77	15112.53	3241.71	0.0	3241.71	23048
49	20153.70	0.0	20153.70	127.53	0.0	127.53	0.0	0.0	0.0	422
50	1492985.00	83559.00	1576544.00	34369.86	2308.35	34668.69	4594.62	916.77	5301.49	192224
51	1252980.00	73747.31	1326727.00	65232.59	1084.02	66316.56	3343.67	132.91	3343.67	159221
52	71230.56	6012.67	76303.56	186.73	43.98	186.73	667.85	456.10	1123.95	12253
53	72874.44	0.0	72874.44	757.89	0.0	757.89	74.62	0.0	74.62	7523
109	5701438.00	235070.06	5936508.00	606144.25	13216.34	619360.56	51170.95	0.0	51170.95	134064
111	154303.50	3521.30	154755.31	15249.62	0.0	15249.62	3267.71	0.0	3267.71	8880
129	465927.50	0.0	465927.50	5857.42	0.0	5857.42	157.33	0.0	157.33	24597
139	64993.41	5985.59	70978.94	6883.41	769.19	7606.67	256.37	50.17	256.37	6769
146	360724.50	32050.59	392775.06	443.91	17.22	443.91	0.0	0.0	0.0	13124
200	1793237.00	2783.53	1793237.00	216770.56	0.0	216770.56	17847.71	0.0	17847.71	214519
201	18566400.0	5335.04	18571728.0	4256397.00	1623.29	4258020.00	623836.00	141.16	623977.12	1202333
202	3906068.00	2060.20	3907525.00	203072.44	0.0	203072.44	19902.13	0.0	19902.13	651984
204	1697460.00	567916.06	2265376.00	637.85	911.22	1549.07	472.97	16675.27	17130.87	182515
205	32029.29	6606.32	38635.61	0.0	0.0	0.0	0.0	0.0	0.0	3208
206	2921.23	129.65	2969.28	0.0	0.0	0.0	0.0	0.0	0.0	1036
207	0.0	1906.37	1906.37	0.0	0.0	0.0	0.0	0.0	0.0	1383
210	15445.13	2414.73	17859.85	687.96	0.0	687.96	0.0	0.0	0.0	873
220	2697753.00	10072.44	2701925.00	349803.94	2083.05	350184.87	35513.11	100.34	35513.11	348069
221	1276806.00	9983.47	1285536.00	64894.16	175.94	64915.40	1062.44	0.0	1062.44	368124
222	1396.93	30859.46	32256.39	253.99	5776.21	6032.20	0.0	3301.83	3301.83	1325
223	269123.06	238542.50	491050.06	13034.02	66043.44	79077.44	820.42	10202.27	11022.68	354402
224	480268.06	14698.82	494966.87	16413.34	39.95	16453.00	2612.98	175.80	2788.78	287700
225	736.27	0.0	738.27	0.0	0.0	0.0	0.0	0.0	0.0	277
254	11468507.0	9490506.00	14391850.0	2228816.00	365233.81	2249713.00	302281.37	34600.84	302957.12	4095850

RENEWABLE FORAGE PRODUCTION BY SLOPE CATEGORY

AND LAND OWNERSHIP

CARRYING CAPACITY AND FORAGE ALLOCATION METHODOLOGY FOR GRAZING ALLOTMENTS

SUITABILITY AND COVER ADJUSTMENTS: MADE TO DATA DELIVERED TO BLM BY JPL.

- COVER:
  - LESS 10% FOR OVERESTIMATION
- SLOPE EXCLUSION
  - GREATER THAN 50% SLOPE UNSUITABLE
- LOW PRODUCTION
  - AREAS OF < 20KG/HA EXCLUDED
- UNAVAILABILITY OF WATER
  - AREAS FURTHER THAN FOUR MILES FROM WATER
- RANGE CONDITION
- EXISTING WILDLIFE USE
- HISTORICAL USE

Forage Condition and Forage Production Forecast Methodology

Since under the Proposed Plan only maintaining good condition or improving fair to poor condition will be prescribed, only improving-condition methodology is considered. This differs from the Draft Plan where a decreasing condition occurred in the No Action Alternative.

The Improving Condition Formula Used:

$$A = B + (B \times C)$$

A = Predicted forage production in AUMs following 20 years of management as proposed by allotment.

B = Estimated current livestock forage production in AUMs by allotment (carrying capacity).

Current livestock forage production was estimated from reviewing past forage surveys and the multistage sampling remote sensing survey competed in 1980.

C = Expected percentage change in condition and trend after 20 years under the management proposed.

Estimates of expected percentage change in condition and trend were based on the assumption that on a normal vegetative condition and trend curve there is a higher percentage increase in values at the lower end of the curve than can be expected at the upper limits of the curve in a set period of time (20 years), e.g., there will be a higher percentage increase between the poor to fair condition than between the good to excellent condition. Therefore, the percentages used in the model were as follows: poor to fair, 40 percent; fair to good, 35 percent; and good to excellent, 25 percent. These percentages are maximum increases in percentage points needed to change the present condition either upward or downward.

Range Condition in the California Desert Conservation Area

Condition rating for allotments refers primarily to the status of the composition cover and the vigor of the vegetation relative to the natural potential of the areas under consideration. Secondarily, the rating refers to the soil stability status relative to the amount of accelerated erosion in evidence. This is judged by comparing representative areas of the allotment to relict areas, exclosures, similar sites in other allotments, and/or historical information.

A stated in the element, certain forage plants were used as indicators of range condition by their characteristic response to grazing pressure. This response is related to their ability to withstand grazing and their palatability to the grazing animals.

Generally "decreasers" decrease in the composition under heavy grazing pressure. "Increasers" increase in the composition under heavy grazing pressure. When conditions deteriorate appreciably, weedy plants or "invader species" become more evident and eventually replace the increasers.

The rankings of excellent, good, fair, and poor were assigned as follows:

Excellent

Plant cover and species composition exhibit amounts and proportions representative of the presumed "climax" for the area. When the potential is high for decreaser species, these species are abundant and in good vigor. When the potential for decreaser species is low, individuals of these species, though infrequent, are in good vigor. There is no evidence of accelerated erosion.

Good

Total plant cover is nearly the same as in the excellent category, but may be lower or higher, depending on the kind of composition changes that have occurred, i.e. grazing may bring an increase in shrubs. Composition shows decline in decreaser species. Increaser species are vigorous. Invader species may be present but do not make up significant amounts of the perennial cover. Accelerated erosion is not noticeable.

Fair

Total perennial plant cover is generally reduced. Decreaser species show reduced vigor and are present as remnant populations in sheltered or protected locations (regularly under bushes). Invaders are present; increasers are increasing, and cover is tending lower. Accelerated erosion is in evidence.

Poor

Plant cover is markedly reduced. Decreasers are gone or those that are left are all in inaccessible areas. The composition has shifted almost entirely to invader and increaser species. Accelerated erosion is very evident.

Examples of species considered as decreasers, increasers, and invaders for different regions of the CDCA follow.

EAST MOJAVE	WEST MOJAVE	NORTH MOJAVE
	DECREASERS	
Boufeloya eriopoda	Stipa speciosa	Stipa speciosa
Muhlenbergia porteri	Oryzopsis hymenoides	Oryzopsis hymenoides
Oryzopsis hymenoides	Poa scabrella	Ceratoides lanata
Hileria jamesii	Ephedra nevadensis	Ephedra nevadensis
Ephedra nevadensis	Atriplex canescens	Atriplex canescens
Ambrosia dumosa		
	INCREASERS	
Juneperus osteosperma	Yucca brevifolia	Juniperus
Artemisia tridentata	Artemisia tridentata	Artemisia tridentata
Yucca spp.	Chrysotharmnus spp.	Chrysothamnus spp.
Opuntia spp.	Sitanion hystrix	Atriplex confertifolia
Haplopappus cooperi	Amsinkia spp.	Sarcobatus vermiculatus
Amsinkia spp.	Descurainia spp.	
	INVADERS	
Bromus rubens	Schismus spp.	Bromus tectorum
Erodium cicutarium	Bromus rubens	Salsola iberica
Schismus spp.	Erodium cicutarium	Halogeton glomeratus
Salsola iberica	Marubium spp.	
Bromus tectorum	Xanthium spp.	

The key perennial forage species, generally called decreasers, of the CDCA are listed below.

PERENNIAL GRASSES

Common Name	Scientific Name
Black grama	Boutelova eriopoda
Blue grama	Boutelova eriopoda
Galleta	Hilaria jamesii
Big galleta	Hilaria rigida
Bush muhly	Muhlenbergia porteri
Indian tricegrass	Oryzopsis hymenoides
Bluegrass	Poa scabrella
Desert needlegrass	Stipa speciosa

FORBS

Globe Mallow	Sphaeralcea amigua

SHRUBS

Bur sage	Ambrosia dumosa
Bur sagebrush	Artemesia spinescens
Four-winged saltbuch	Atriplex canescens
Winterfat	Ceretoides tanata
Nevada tea	Ephedra nevadensis
Hop sage	Grayia spinosa
Grays' ratany	Krameria grayi
Range ratany	Drameria parvifolia
Desert bitterbrush	Purshia glandulosa

ALLOTMENT WRITE-UP

I. Allotment - Name: West Hills Public Acreage: 59,580 Ac.

II. Leases (Number of Allotment): 1

III. Pertinent Information Related to Grazing Allotment Carrying Capacity

A. Remote Sensing Survey 1976-1980

1. Total Standing Vegetative Biomass: 139,427,936 kg

2. Total Production
   a. Forage _____ kg
   b. Non-Forage _____ kg
   c. Total _____ kg

3. Total Renewable Forage Production

   (All slope Classes 1978-79 3,323,065 kg 7,384 AUM

4. Adjusted Renewable Forage Production

   (Suitability & wet-dry year variation adjustment) 10% 1,923,480 kg 4,274 AUM

B. Previous Livestock Carrying Capacity Determinations

Name - Method		Year	Results
1. Coso	Ocular, recon.	1966	2,431
2. Range	Ocular, recon.	1971	2,843

IV. Recommended Carrying Capacity 1,923,480 kg 4,274 AUM

A. Condition Rating Exclusion % 25

Condition Fair 480,870 kg 1,069 AUM

B. Wildlife Allocation 63 AUM

C. Wild Horse and Burro Allocation 0 AUM

D. Available Livestock Allocation 3,102 AUM

E. Recommended Livestock Allocation 1,105 AUM

V. Forage Production Determination from Remote Sensing Survey 1976-1979.

A. Acreage Corrections

1. Draft Acreage 55,210

2. Acreage Adjustments Rationale None - JPL used

3. Total Acres in Allotment 59,580

B. Renewable Forage Production by Digitized Slope Class

1.	0-25%	2,959,305 kg	6,576AUM
2.	26 - 50%	343,568 kg	
3.	> 50%	20,191 kg	
	TOTAL	3,323,064 kg	7,384AUM

C. Slope Exclusion 26 - 100

D. Water Exclusions % 25

E. Cover adjustment from low level photos % 10

F. Other Exclusions % 0

G. Low production spectral class exclusion 0 AUM

H. Adjusted Renewable Forage Production (Suitability Correction) 1,923,480 kg 4,274AUM

VI. Historical Information

A. 1979 Authorized Use

1. Ephemeral: _____ AUM

2. Perennial

a. Authorized 1,104 AUM

b. Exchange of Use _____ AUM

c. Non-Use _____ AUM

d. Suspended Non-Use _____ AUM

B. 3 - 5 Year Average Authorized Use

	Perennial	Ephemeral
1975	1104	
1976	1104	
1978	1104	
1979	1104	
Average	1104	

C. Ranchers' Opinion On Use 1,500 AUM

Year: 1978 questionnaire

D. Other

Source and Year:

VII. Rationale for

A. Allocation Draft = (NA) 1,105 (B) 896

A major reduction in burros will help improve allotment condition, thus maintaining stocking rate and monitoring for condition increase by utilization. A future increase may occur. Majority of use now being made by excess wild burros.

B. Difference from Draft Plan Carrying Capacity (CC) and Why

(Draft CC = 2,520) (Plan CC = 4,274)

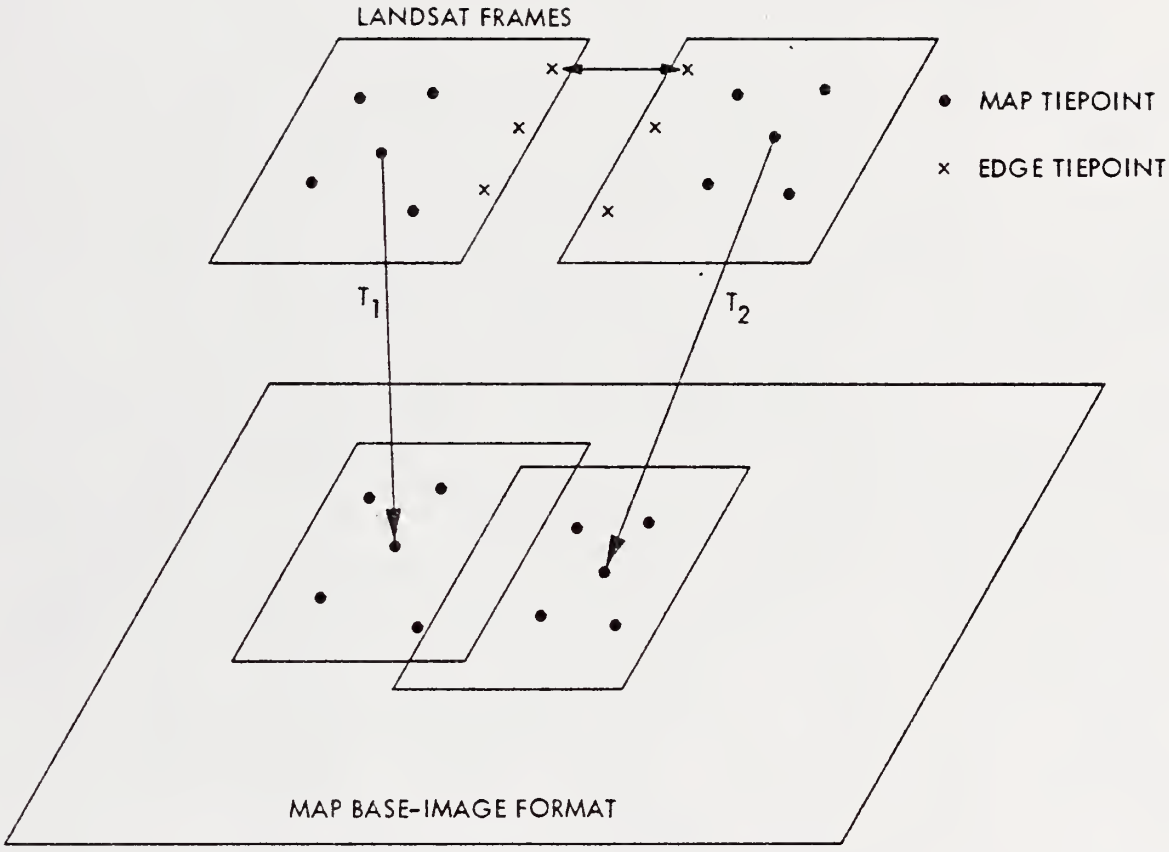
Landsat information more accurate than past survey used for basis of carrying capacity.

SOILS INVENTORY PROCEDURE

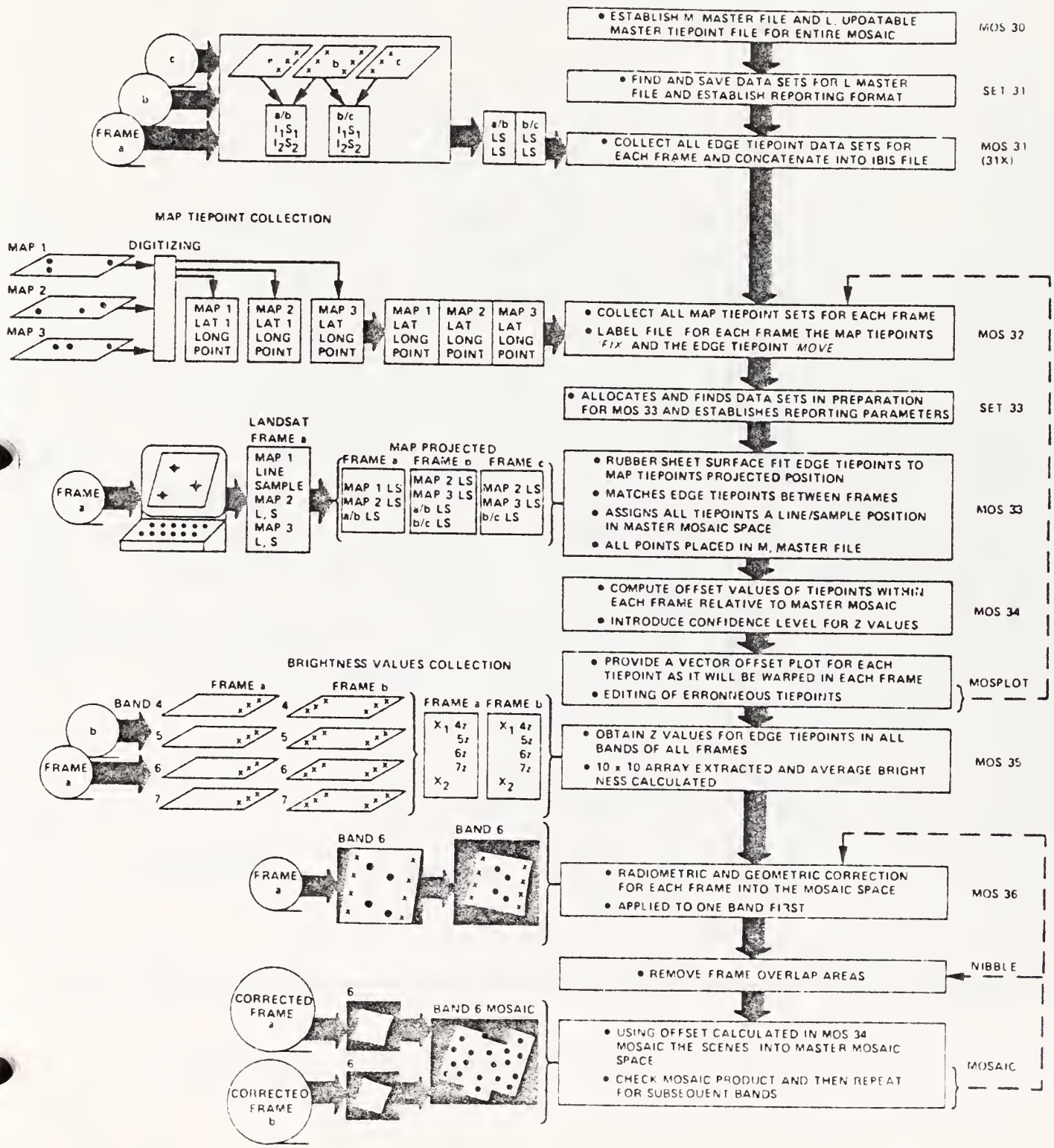
AL ENDO
BLM

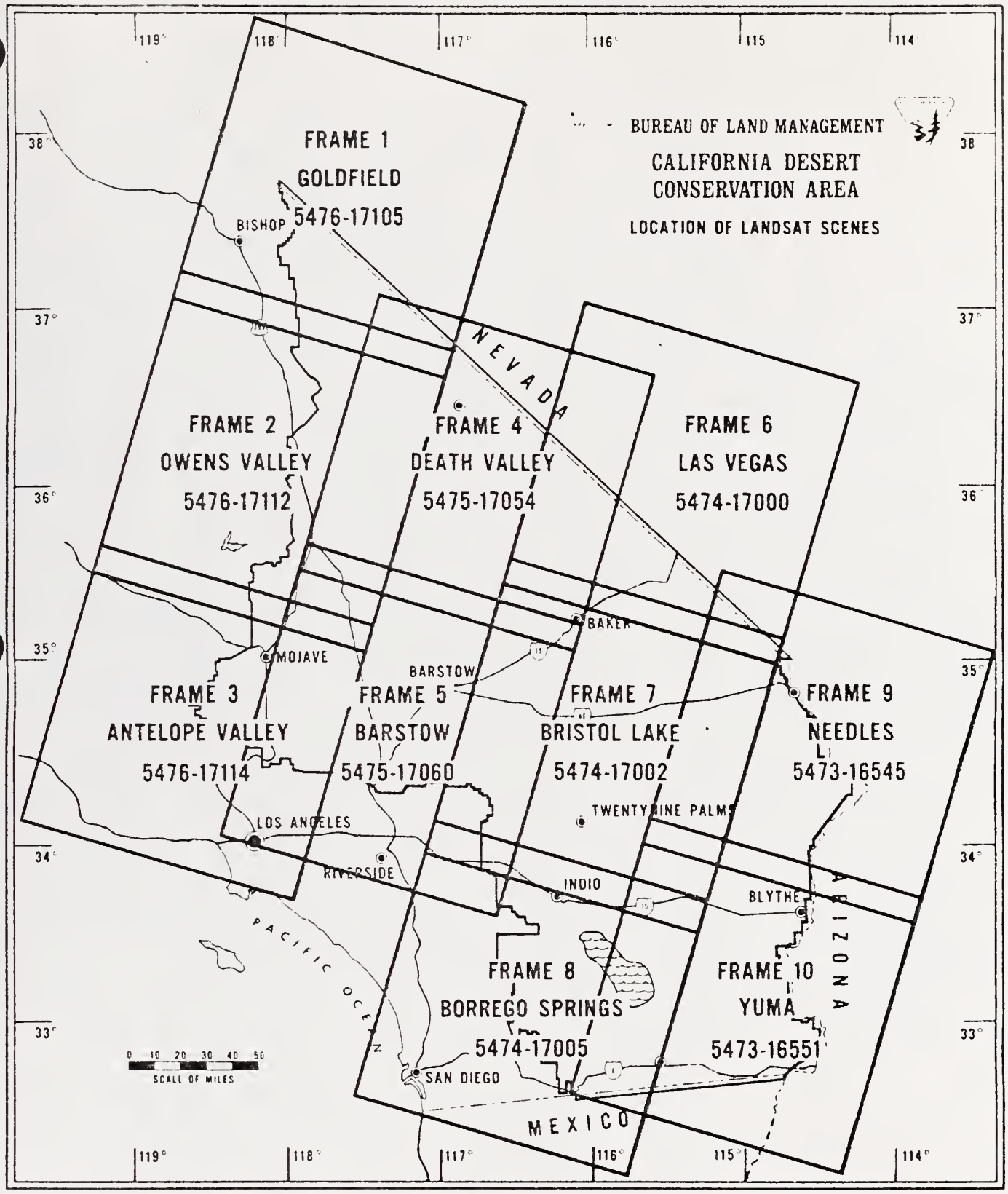
SATELLITE IMAGE MOSAICKING TECHNOLOGY

AL ZOBRIST
JPL

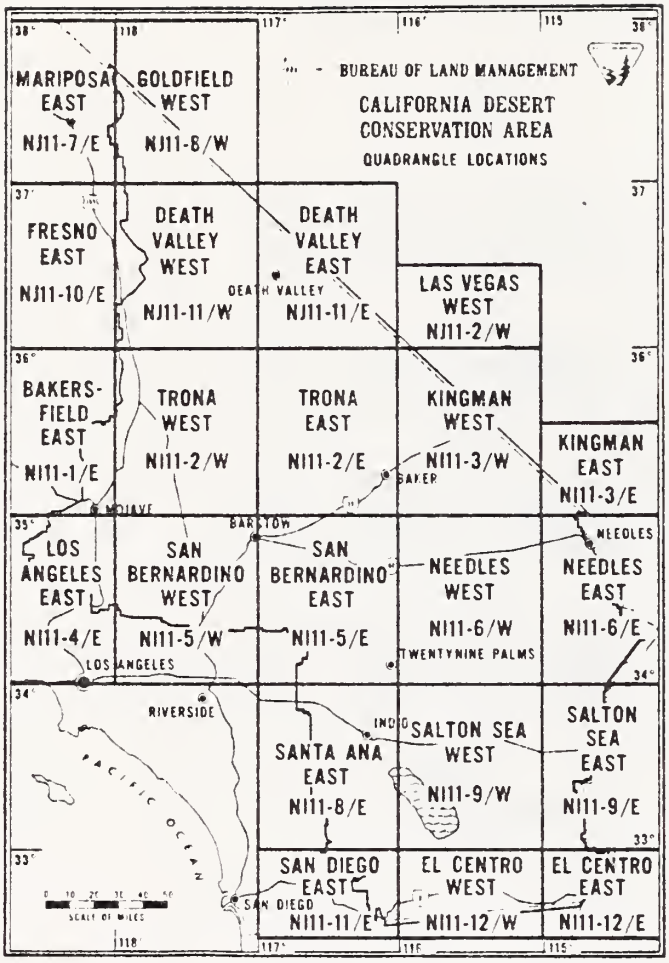

LANDSAT FRAMES
MAP TIEPOINT
EDGE TIEPOINT
T_1
T_2
MAP BASE-IMAGE FORMAT

MOSAICKING PROCESS



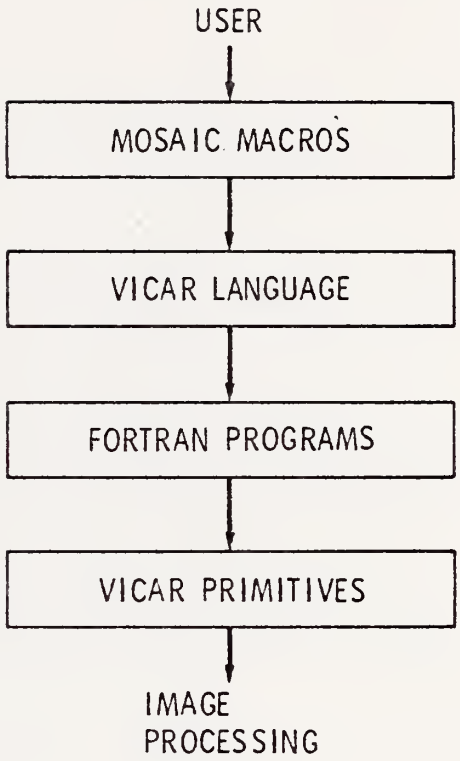


LOCATION OF LANDSAT FRAMES FOR THE CDCA.



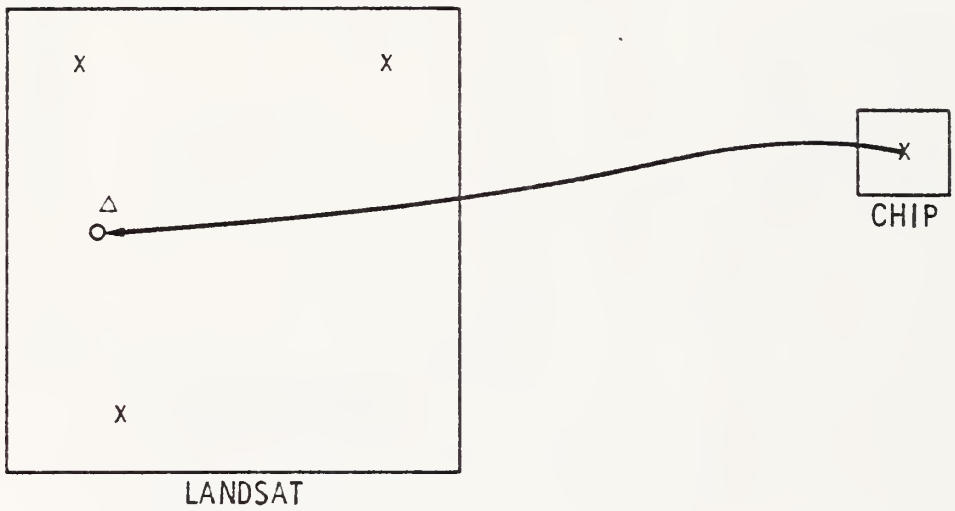
THE 1° X 1° QUADRANGLES USED IN THE CDCA.

PROCESSING LEVELS



CORRELATION TECHNIQUE - 1

x APPROXIMATE CONTROL POINTS (LAT LON)

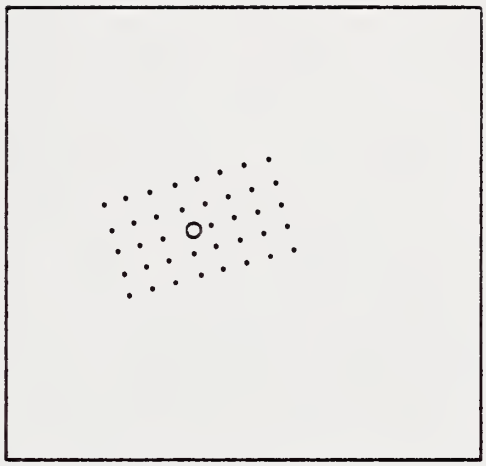


○ ESTIMATED LOCATION

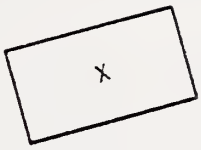
△ TRUE LOCATION FOUND BY 2-D FFT PHASE CORRELATION

TRUE LOCATION FED BACK TO ESTIMATOR

CORRELATION TECHNIQUE - 2



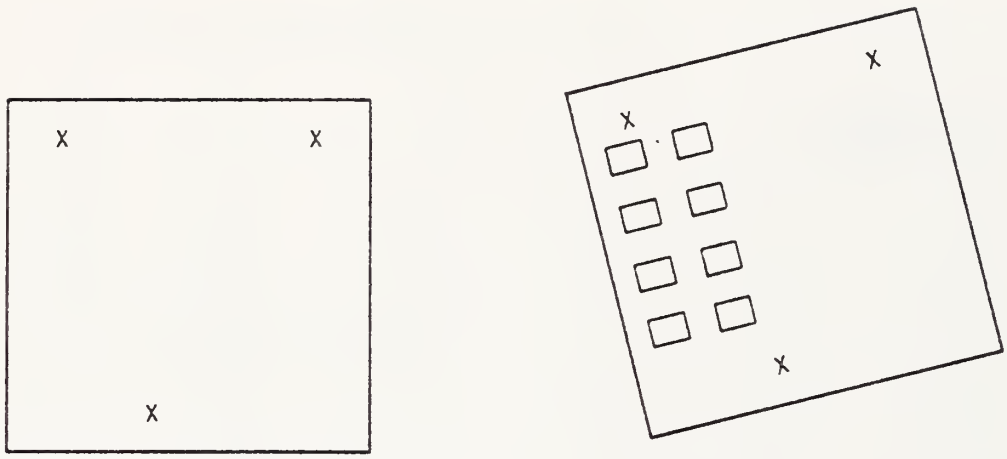
50 x 50 LANDSAT



57 x 79 CHIP

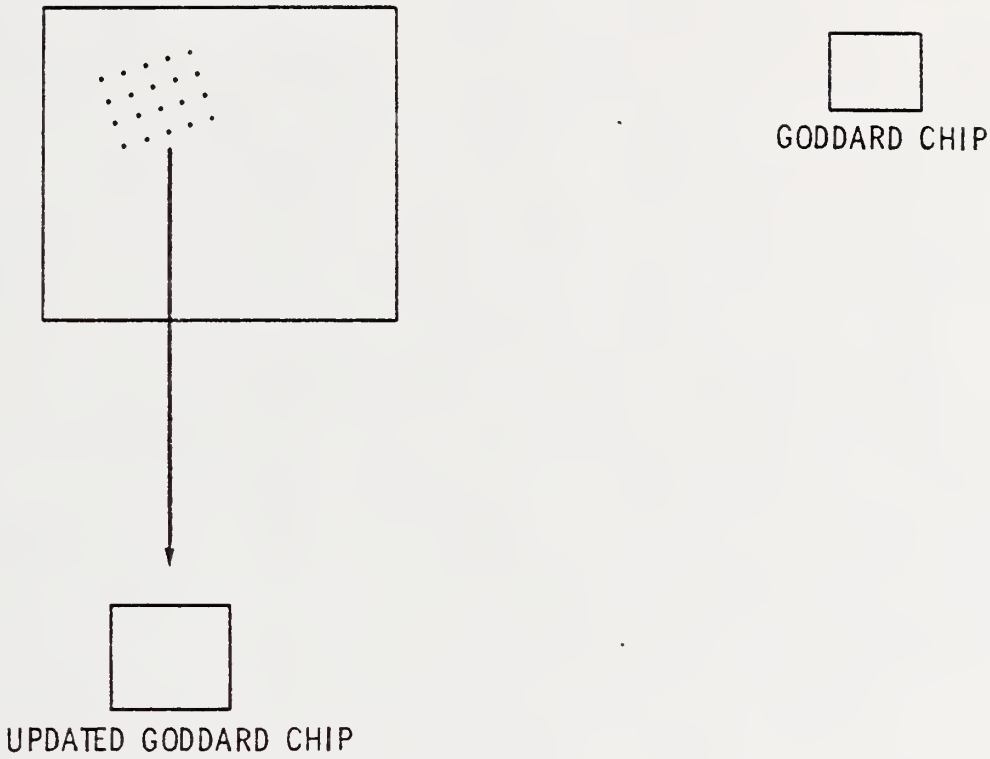
CONTROL POINTS DEFINE A RESAMPLING GRID
TO ENABLE CORRELATION WITH FRAMES OF
ARBITRARY SCALE, ASPECT, ROTATION

CORRELATION TECHNIQUE - 3



FRAME TO FRAME CORRELATION ACCOMPLISHED BY SPECIFYING A GRID OF CHIPS IN THE SECOND FRAME

CORRELATION TECHNIQUE - 4



MASTER DATA PROCESSOR REGISTRATION
MDP CHIP TO RAW LANDSAT MATCH

FRAME 2

MDP SEQUENCE NUMBER	CORRELATION VALUE	LINE	SAMPLE	LATITUDE	LONGITUDE	LINE RESIDUAL	SAMPLE RESIDUAL
1	172.902542	2055.09014	2407.09741	32.455552	112.860489	-2.004000	2.437500
2	214.621341	1691.70117	2325.05223	32.715170	112.847321	-1.735156	0.000
3	271.527100	1453.01190	2307.74048	32.890190	112.816315	-1.101563	1.312500
4	194.942719	815.621620	2910.74438	33.434647	112.365143	7.539063	4.562500
5	106.231700	522.521240	3214.59692	33.404674	112.098907	-0.503906	-0.437500
6	450.166748	266.713080	2013.47359	33.703934	112.423889	-2.300781	-2.187500
7	256.068115	1698.23560	1215.92017	32.824341	113.520529	2.929688	3.312500
8	276.293416	841.596396	1661.31714	33.389557	113.160262	0.449313	2.062500
9	125.513037	197.087505	1304.95430	33.672035	112.178497	-5.525938	4.687500
10	151.963741	160.362210	1933.01656	33.335052	112.022693	1.219041	-3.437500
11	143.801224	1117.38769	3103.02143	33.056244	112.265640	5.539063	-10.437500
12	243.974639	1724.38890	2647.24302	32.858965	112.651744	-3.757813	7.000000
13	310.812744	2170.29077	1645.19478	32.445878	113.343201	-0.408844	-2.437500
14	296.191875	2321.42285	1072.17529	32.391296	113.718201	-0.281250	-3.812500
15	490.679199	1691.00757	563.972412	32.919739	113.913361	1.914063	-1.562500
16	335.508843	1377.39844	323.126465	33.135991	114.010132	0.570313	-0.875000
17	200.007339	607.908494	2600.87795	33.402555	112.999400	-2.953125	1.125000
18	342.033447	1654.98267	1434.05591	32.833252	113.365178	2.000000	1.875000
19	283.514875	1242.03521	1654.30762	33.103513	113.547760	1.078125	5.187500
20	366.741699	1212.01562	1738.76514	33.118042	113.122040	0.657969	0.437500

MOSAIC FRAME TO FRAME REGISTRATION

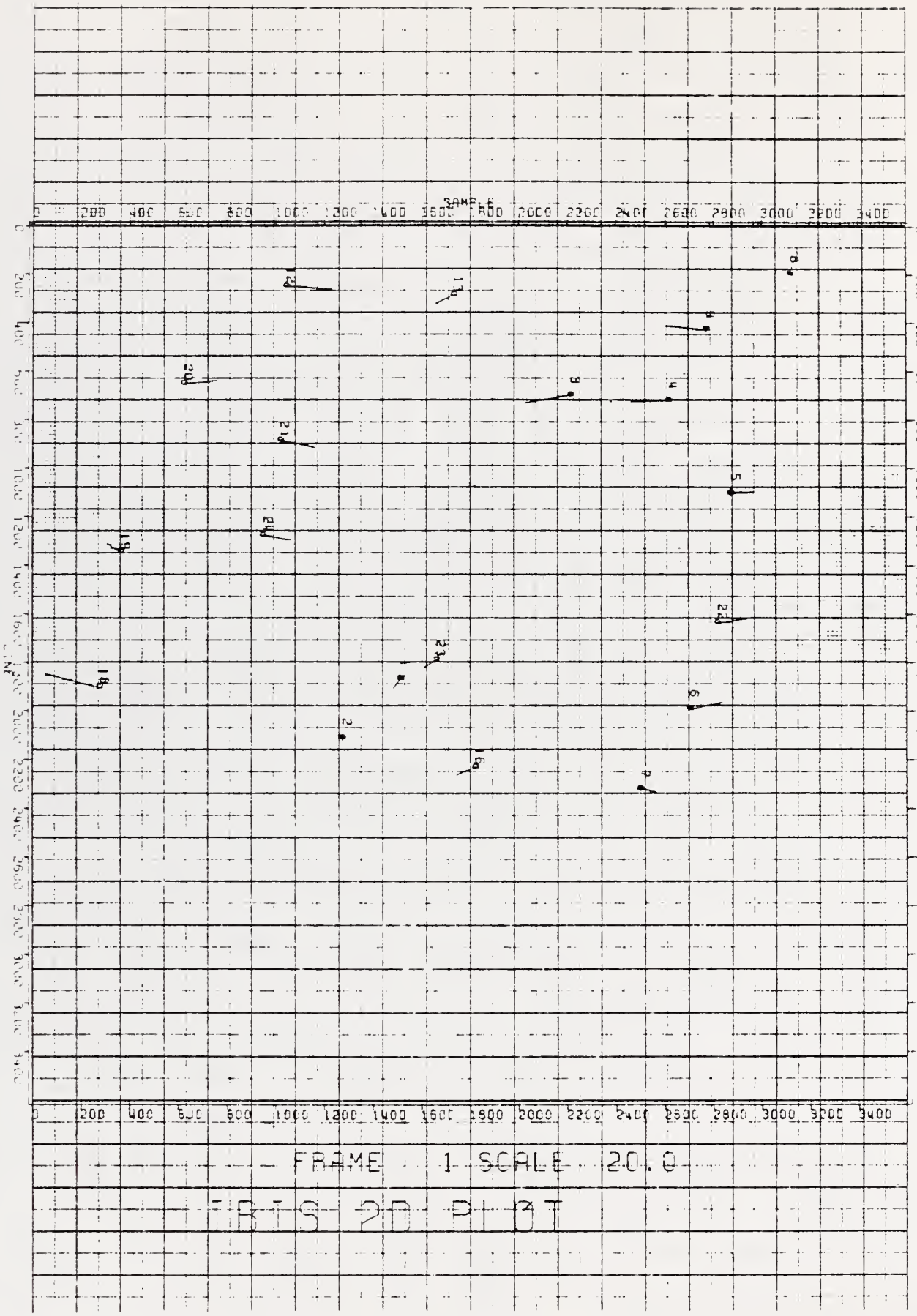
FRAME 1 TO FRAME 2

SEQUENCE NUMBER	CORRELATION VALUE	FROM LINE	FROM SAMPLE	TO LINE	TO SAMPLE	LINE RESIDUAL	SAMPLE RESIDUAL
2	426.55225	2876.35364	176.95430	20.00000	320.00000	-1.16846	-0.45546
3	620.88574	2876.87891	302.97363	20.00000	452.00000	-0.76831	-0.45377
4	789.34692	2876.95728	428.98633	20.00000	578.00000	-0.81006	-0.41837
5	852.41992	2877.01050	554.99146	20.00000	704.00000	-0.87695	-0.39029
6	788.27612	2877.05347	680.99048	20.00000	830.00000	-0.95410	-0.36832
7	681.44043	2877.10498	806.99805	20.00000	956.00000	-1.02271	-0.33780
8	511.98364	2877.14648	932.99634	20.00000	1082.00000	-1.10132	-0.31656
9	691.25244	2877.85034	1059.03296	20.00000	1208.00000	-0.51782	-0.25699
10	751.59424	2877.95679	1185.00684	20.00000	1334.00000	-0.53149	-0.26016
11	765.64844	2878.01367	1311.02222	20.00000	1460.00000	-0.59473	-0.22183
12	705.79736	2878.09229	1437.01294	20.00000	1586.00000	-0.63623	-0.20416
13	521.41089	2878.78906	1563.05078	20.00000	1712.00000	-0.05957	-0.14737
14	633.47119	2878.84937	1689.04956	20.00000	1838.00000	-0.11938	-0.12594
15	685.51050	2878.95947	1815.04053	20.00000	1964.00000	-0.12939	-0.11172
16	727.17554	2879.01685	1941.05762	20.00000	2090.00000	-0.19214	-0.07169
17	636.04614	2879.07935	2067.04663	20.00000	2216.00000	-0.25600	-0.05972
18	502.41895	2879.76147	2193.07446	20.00000	2342.00000	0.31201	-0.00894
19	569.99023	2879.85205	2319.08350	20.00000	2468.00000	0.26247	0.02304
20	695.88281	2879.97046	2445.07764	20.00000	2594.00000	0.26076	0.04013
21	651.55518	2880.05591	2571.09741	20.00000	2720.00000	0.24609	0.06286
22	572.93359	2880.14136	2697.11890	20.00000	2846.00000	0.21143	0.12704
23	409.08252	2880.26733	2823.16821	20.00000	2972.00000	0.21729	0.19931
24	619.81104	2880.91138	2949.13159	20.00000	3098.00000	0.74121	0.18564
25	575.43242	2881.01831	3075.09082	20.00000	3224.00000	0.72778	0.16782
26	400.51343	2881.49194	3201.13770	20.00000	3350.00000	1.08130	0.23704
27	217.58344	2941.66602	60.92670	65.00000	200.00000	19.22388	0.48865
28	599.18555	2921.79907	176.92258	65.00000	320.00000	-0.76318	-0.44231
29	702.04443	2921.88354	302.94653	65.00000	452.00000	-0.79883	-0.44547
30	789.17651	2921.94263	428.96729	65.00000	578.00000	-0.85986	-0.40201
31	861.76733	2921.99292	554.95142	65.00000	704.00000	-0.92969	-0.39493
32	784.83643	2922.06177	680.95386	65.00000	830.00000	-0.98096	-0.36954
33	525.08887	2922.70557	806.97705	65.00000	956.00000	-0.45728	-0.32339
34	652.24780	2922.74048	932.97925	65.00000	1082.00000	-0.54248	-0.29825
35	750.81177	2922.84888	1058.99731	65.00000	1208.00000	-0.55444	-0.25723
36	867.41870	2922.95625	1185.00244	65.00000	1334.00000	-0.56519	-0.22916
37	873.19775	2923.01562	1310.99902	65.00000	1460.00000	-0.62793	-0.20963
38	755.75415	2923.09985	1437.00952	65.00000	1586.00000	-0.66382	-0.17618
39	680.58521	2923.12402	1563.01758	65.00000	1712.00000	-0.75977	-0.14517
40	682.29395	2923.87549	1689.01343	65.00000	1838.00000	-0.12842	-0.12637
41	754.07275	2923.93091	1815.03979	65.00000	1964.00000	-0.19312	-0.07700
42	814.06421	2924.02710	1941.04907	65.00000	2090.00000	-0.21704	-0.04483
43	722.79126	2924.07910	2067.01855	65.00000	2216.00000	-0.28540	-0.05240
44	608.53546	2924.22192	2193.08423	65.00000	2342.00000	-0.26270	0.03622
45	668.90039	2924.90430	2319.05322	65.00000	2468.00000	0.29956	0.02817
46	745.83789	2924.97339	2445.07642	65.00000	2594.00000	0.24854	0.07431

LANDSAT DIGITAL MOSAIC TIEPOINT DATA SET

CASE RGM900.AZT STEP 5

FRAME		TIEPOINT SEQ	TIEPOINT TYPE	OFFSET		TO LINE	TO SAMP	FROM LINE	FROM SAMP	TO Z	FROM Z	INTERFRAME ERR LINE	INTERFRAME ERR SAMP	DELTA Z	Z CONFIDENCE TO	Z CONFIDENCE FROM	BAND 4 Z	BAND 5 Z	BAND 6 Z	BAND 7 Z
2	1	2	MOVE	4300	3650	165	1290	20	335	91.5	91.3	1.6	-2.2	0.1	100	100	90.1	123.1	125.4	96.7
2	1	3	MOVE	4300	3650	216	1539	20	551	112.0	111.9	1.5	-2.2	0.1	100	100	111.3	174.4	181.8	145.5
2	1	4	MOVE	4300	3650	268	1777	20	766	102.0	101.8	1.3	-2.4	0.2	100	100	101.3	146.6	151.1	121.2
2	1	5	MOVE	4300	3650	320	2019	20	981	77.2	77.0	1.1	-3.4	0.3	100	100	77.2	105.5	112.7	91.6
2	1	6	MOVE	4300	3650	372	2262	20	1197	73.7	73.4	0.8	-4.3	0.3	100	100	74.5	108.8	116.1	92.8
2	1	7	MOVE	4300	3650	423	2503	20	1412	97.7	97.5	0.5	-5.9	0.2	100	100	94.6	158.6	169.7	139.5
2	1	8	MOVE	4300	3650	475	2747	20	1627	95.0	94.6	0.3	-5.3	0.2	100	100	92.6	154.2	162.8	135.1
2	1	9	MOVE	4300	3650	527	2992	20	1843	69.1	69.0	0.3	-3.7	0.2	100	100	74.9	108.3	117.9	94.8
2	1	10	MOVE	4300	3650	579	3236	20	2058	69.5	69.3	0.3	-3.0	0.2	100	100	69.2	100.6	109.8	90.5
2	1	11	MOVE	4300	3650	630	3478	20	2273	77.1	76.9	0.1	-2.6	0.2	100	100	80.2	129.0	139.2	110.6
2	1	12	MOVE	4300	3650	682	3720	20	2489	67.6	67.4	-0.0	-2.5	0.2	100	100	66.3	95.5	105.3	86.0
2	1	13	MOVE	4300	3650	733	3963	20	2704	56.2	56.4	-0.2	-2.6	-0.2	100	100	55.7	81.0	86.3	71.7
2	1	14	MOVE	4300	3650	786	4206	20	2919	74.7	74.4	0.3	-3.7	0.3	100	100	75.7	123.6	129.9	103.9
2	1	15	MOVE	4300	3650	838	4449	20	3135	81.0	80.7	0.1	-4.1	0.2	100	100	80.9	139.7	147.9	122.3
2	1	16	MOVE	4300	3650	889	4693	20	3350	56.4	56.3	-0.1	-4.4	0.0	100	100	59.1	78.0	80.3	61.6
2	1	18	MOVE	4300	3650	361	1246	145	335	105.1	104.7	1.4	-1.7	0.3	100	100	106.8	159.6	161.9	127.8
2	1	19	MOVE	4300	3650	413	1490	145	551	112.7	112.6	1.2	-1.9	0.1	100	100	112.1	167.8	172.8	139.3
2	1	20	MOVE	4300	3650	465	1733	145	766	78.7	78.5	1.0	-2.1	0.3	100	100	80.9	107.8	112.5	89.3
2	1	21	MOVE	4300	3650	516	1976	145	981	99.2	99.0	0.9	-2.2	0.2	100	100	99.9	155.3	162.0	132.4
2	1	22	MOVE	4300	3650	568	2219	145	1197	100.9	100.7	0.7	-2.4	0.3	100	100	102.4	167.0	176.6	145.3
2	1	23	MOVE	4300	3650	620	2463	145	1412	80.4	80.3	0.5	-2.6	0.1	100	100	95.0	100.5	166.5	139.0
2	1	24	MOVE	4300	3650	672	2706	145	1627	78.3	78.4	0.3	-2.8	-0.1	100	100	83.1	127.9	135.1	110.3
2	1	25	MOVE	4300	3650	723	2948	145	1843	71.9	72.1	0.1	-3.6	-0.1	100	100	73.5	110.2	121.3	103.2
2	1	26	MOVE	4300	3650	775	3192	145	2056	76.6	76.6	-0.0	-2.6	0.0	100	100	76.5	122.9	130.4	105.2
2	1	27	MOVE	4300	3650	826	3434	145	2273	80.8	80.8	-0.2	-2.2	0.0	100	100	81.5	132.6	139.4	111.2
2	1	28	MOVE	4300	3650	878	3677	145	2489	80.9	80.8	-0.3	-1.9	0.0	100	100	80.8	126.0	130.6	103.3
2	1	29	MOVE	4300	3650	930	3919	145	2704	62.0	61.9	-0.2	-2.3	0.2	100	100	62.4	88.3	92.6	72.7
2	1	30	MOVE	4300	3650	982	4162	145	2919	85.3	85.2	0.0	-3.4	0.0	100	100	86.1	130.6	134.6	106.4
2	1	31	MOVE	4300	3650	1034	4405	145	3135	66.1	65.9	-0.2	-3.8	0.2	100	100	64.3	93.0	96.7	76.7
2	1	34	MOVE	4300	3650	557	1203	270	335	100.0	100.5	1.1	-1.4	-0.6	100	100	104.4	155.1	159.7	126.6
2	1	35	MOVE	4300	3650	609	1446	270	551	95.7	95.8	0.9	-1.6	-0.1	100	100	94.0	140.2	140.9	114.4
2	1	36	MOVE	4300	3650	661	1689	270	766	105.4	105.3	0.8	-1.7	0.1	100	100	106.0	156.5	160.2	139.7
2	1	37	MOVE	4300	3650	713	1932	270	981	97.1	97.0	0.6	-1.9	0.1	100	100	96.6	140.6	152.3	123.7
2	1	38	MOVE	4300	3650	765	2175	270	1197	75.6	76.3	0.4	-2.1	-0.7	100	100	84.3	121.3	136.3	123.4
2	1	39	MOVE	4300	3650	816	2419	270	1412	102.6	102.8	0.3	-2.2	0.0	100	100	103.3	167.3	175.9	144.1
2	1	40	MOVE	4300	3650	868	2662	270	1627	87.9	88.0	0.1	-2.5	-0.2	100	100	90.2	139.5	147.0	122.2
2	1	41	MOVE	4300	3650	920	2905	270	1843	93.8	93.8	-0.0	-2.1	0.0	100	100	94.6	140.0	152.9	126.0
2	1	42	MOVE	4300	3650	972	3148	270	2058	88.8	88.7	-0.2	-1.8	0.0	100	100	87.6	143.0	150.9	124.3
2	1	43	MOVE	4300	3650	1023	3390	270	2273	105.6	105.7	-0.4	-1.5	-0.0	100	100	106.2	173.3	181.6	147.0
2	1	44	MOVE	4300	3650	1074	3633	270	2489	89.9	89.9	-0.6	-1.3	-0.0	100	100	85.1	138.4	146.7	120.0
2	1	45	MOVE	4300	3650	1126	3875	270	2704	95.1	95.1	-0.9	-2.0	0.1	100	100	95.0	159.8	160.6	129.6
2	1	46	MOVE	4300	3650	1179	4118	270	2919	55.0	55.1	-0.2	-3.1	-0.0	100	100	49.1	63.8	130.1	133.7
2	1	47	MOVE	4300	3650	1230	4362	270	3135	86.5	86.4	-0.4	-3.3	0.1	100	100	83.0	140.4	146.2	117.6
2	2	1	FIX	4300	3650	3866	2417	2055	2409	148.5	*******	0.0	0.0	*******	100	100	103.2	153.1	159.4	127.3
2	2	2	FIX	4300	3650	3274	2952	1692	2325	169.1	*******	0.0	0.0	*******	100	100	108.4	174.4	185.2	150.8
2	2	3	FIX	4300	3650	2893	3017	1453	2308	159.8	*******	0.0	0.0	*******	100	100	97.7	158.4	167.3	132.3


FRAME 1 SCALE 20.0
TRTS 2D PLOT

MOSAIC VERIFICATION FILE FOR RGM900.AZT

FRAME	LSAT SEQ	DATE	AREA	COLOR SEQUENCE	BAND SEQUENCE
1	2874-17061	14JUN77	PRESCOTT II	GRN RED IR1 IR2 4	5 6 7
2	2874-17064	14JUN77	GILA BEND II	GRN RED IR1 IR2 4	5 6 7
3	2873-17003	13JUN77	MOGOLLON RIM II	GRN RED IR1 IR2 4	5 6 7
4	2873-17010	13JUN77	PHOENIX II	GRN RED IR1 IR2 4	5 6 7

```
     F1F401E405F7F7                                                                    *14JUN77
NCHAR=                16
LAB FOUND =
     C7C9D3C140C2C5D5C440 C9C940404040                                                 *GILA.BEND.II....
NCHAR=                 5
LAB FOUND =
     40C909F140                                                                        *.IR1.
NCHAR=                 3
LAB FOUND =
     40F640                                                                            *.6.

115226  12 GETZVAL  MOS35X        1    1    0    0  4 5 0 0 0 0 0 0 0 0 0 0 0 T
INPUT   NL=     2340 NS=     3370
          REJECT          3       GET          8          9        22                P
2874-17064     6  IR1    14JUN77    GILA BEND II                          IHC
N33-10/W113-08  HDG      SUN EL56  AZ095  PRC121     79.97M/L. 57.00M/SIHL


                              T FILE  4                 3                            F

115252  13 INSERT   MOS35X        1    1    0    0  3 0 0 0 0 0 0 0 0 0 4 0 0 0 T
INPUT   NL=     2340 NS=     3370
2874-17064     7 IR2    14JUN77    GILA BEND II                          IHC
N33-10/W113-08  HDG      SUN EL56  AZ095  PRC121     79.97M/L. 57.00M/SIHL
OUTPUT  SL=        1 SS=        1 NL=     2340 NS=     3370
LABELS SAME AS INPUT

115451  14 LABVFY   MOS35X        1    1    0    0  4 2 0 0 0 0 0 0 0 0 0 0 0 T
INPUT   NL=     2340 NS=     3370
        KEYCOL 1 KEY 2 IBFIND 10 2 3 4 7 5 6 16 7 8 9 10                             P
2874-17064     7 IR2    14JUN77    GILA BEND II                          IHC
N33-10/W113-08  HDG      SUN EL56  AZ095  PRC121     79.97M/L. 57.00M/SIHL
        5 14 15 3 18                                                                 P

NCHAR=                10
LAB FOUND =
     F2F8F7F460F1F7F0F6F4                                                              *2874.17064
NCHAR=                 7
LAB FOUND =
     F1F401E405F7F7                                                                    *14JUN77
NCHAR=                16
LAB FOUND =
     C7C9D3C140C2C5D5C440 C9C940404040                                                 *GILA.BEND.II....
NCHAR=                 5
LAB FOUND =
     40C9D9F240                                                                        *.IR2.
NCHAR=                 3
LAB FOUND =
     40F740                                                                            *.7.

115453  15 GETZVAL  MOS35X        1    1    0    0  4 5 0 0 0 0 0 0 0 0 0 0 0 T
INPUT   NL=     2340 NS=     3370
          REJECT          3       GET          8          9        23                P
2874-17064     7 IR2    14JUN77    GILA BEND II                          IHC
N33-10/W113-08  HDG      SUN EL56  AZ095  PRC121     79.97M/L. 57.00M/SIHL


115520  16 REPORT   MOS35X        1    1    0    0  5 0 0 0 0 0 0 0 0 0 0 0 0 T
```

FUTURE PROSPECTS, SUMMARY AND CONCLUSIONS

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HYRUM JOHNSON

715-91

Earth Resources Applications Group

Resource Inventory Techniques Used in the California Desert Conservation Area

Arid Lands Resources Inventories Workshop

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October 15, 1980

National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

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Paper for Presentation at the
Arid Lands Resources Inventories Workshop
La Paz, Mexico
November 30 - December 6, 1980

October 15, 1980

National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

RESOURCE INVENTORY TECHNIQUES USED IN THE CALIFORNIA DESERT CONSERVATION AREA[1]

Ronald G. McLeod[2]

Hyrum B. Johnson[3]

A variety of conventional and remotely sensed data for the 25 million acre California Desert Conservation Area (CDCA) have been integrated and analyzed to estimate range carrying capacity. Multispectral classification was performed on a digital mosaic of ten Landsat frames. Multispectral classes were correlated with low level aerial photography, quantified and aggregated by grazing allotment, land ownership, and slope.

BACKGROUND

The issues which land management planners must address arise from the fundamental conflicts which occur with an increasingly expanding and mobile population and finite natural resources. The intricacy and complexities of human activities often place severe pressures on the desert environment and its ecosystems. Historically, the preservation and improvement of the natural environment has taken a back seat to progress and the development of natural resources. State and Federal legislatures are responding to the pressures put on the environment by enacting laws in which environmental values and conditions are appraised and preserved. The appraisal of environmental conditions requires inventory; and a good inventory is absolutely basic to subsequent planning.

The Bureau of Land Management (BLM) in the State of California has been mandated by Congress to prepare and implement a comprehensive, long-range multiple use management plan for the 25 million acre California Desert Conservation Area (CDCA) shown in figure 1 and provide in the plan protection and appropriate use for the 12.1 million acres of BLM administered public lands in the CDCA.[4] The Act requires that the plan take into account the principles of multiple use and sustained yield in providing resource use and developement, while assuring the maintenance of environmental quality. Twelve plan elements were formulated to prescribe desert-wide management direction for Cultural Resources, Native American Values, Wildlife, Wilderness, Wild Horse and Burros, Recreation, Motorized Vehicle Access, Geology-Energy-Minerals, Energy Production-Utility Corridors, Land Tenure Adjustment, Vegetation, and Livestock Grazing.[5] It is the input to the management direction for the Vegetation and Livestock Grazing elements that is the theme of this paper.

The BLM currently leases 4.5 million acres of the CDCA in 53 grazing allotments for cattle and sheep grazing. Approximately 60,000 sheep (40,000 animal unit months,AUMs) and 10,000 cattle (120,000 AUMs) obtain all or part of their sustenance from the California Desert (fig. 1).[6] Sheep grazing is generally intermittent depending on the locality and type of ranching operation, as well as the pattern of annual rainfall. Proper management

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[1]Paper presented at Arid Lands Resources Inventories Workshop. [La Paz, Mexico, November 30-December 6, 1980]. This paper presents one phase of research conducted at the Jet Propulsion Laboratory, California Institute of Technology under NAS7-100, sponsored by the National Aeronautics and Space Administration.

[2]Ronald G. McLeod is a Senior Engineer and Geographer at the Jet Propulsion Laboratory's Image Processing Laboratory, Pasadena, California.

[3]Hyrum B. Johnson, formerly Lead Range Conservationist with the BLM Riverside District Office and Desert Plan Staff is now at the Grassland Soil and Water Research Laboratory, Temple, Texas.

[4]Federal Land Policy and Management Act, Section 601, Public Law 94-579, the 94th United States Congress, 1976.

[5]The California Desert Conservation Area Final Environmental Impact Statement and Plan, U.S. Department of Interior, Bureau of Land Management, October 1, 1980.

[6]An AUM is the amount of forage required to sustain one cow, or its equivalent, for one month; 450 kg. air dry weight of forage.

techniques dictate that accurate range carrying capacity estimates be calculated to insure a sustained yield multiple use of the land for grazing. Just as improper range management can lead to reduction of production capacity, improper management may also lead to failure to allocate all lands suitable for grazing, thus wasting usable forage.

Although the BLM leases only 4.5 million acres of the 25 million acres in the CDCA, grazing allotments are distributed throughout the entire region, often including private land parcels. Resource information must be gathered in all parts of the desert in order to properly estimate the production of forage and in turn determine range carrying capacity. Resource information for this sparsely occupied portion of the state is incomplete. Data available for specific areas vary in type and quality, presenting difficulties in obtaining uniform interpretations. Due to time and budget constraints, methods other than conventional mapping and inventorying techniques were needed to obtain much of the required resource data. The feasibility of using multispectral classification of Landsat digital data for the CDCA plan was explored by representatives of the BLM Desert Plan Staff at the EROS Data Center[7] in early 1977. In general, the results were highly favorable and the conceived potential was found to greatly exceed the initial expectations. However, different systems and procedures needed to be implemented if an approach to uniform classification for biomass over the entire region was to be realized.

The BLM was presented with a challenging task: obtain accurate range carrying capacity statistics not only for currently leased grazing allotments but also for all BLM administered lands throughout the CDCA so that decisions in the future could be made as to proper land use and range allocations. Such a problem required the compilation and integration of data from a variety of map and remotely sensed sources as shown in figure 2, a task made difficult by the sheer size of the CDCA.

APPROACH TO THE PROBLEM

The BLM personnel turned to the Jet Propulsion Laboratory's (JPL) Image Processing Laboratory to assist in first preparing a controlled digital mosaic of ten Landsat scenes to cover the entire CDCA prior to digital classification of the spectral data. Considerable work has been done at JPL's Image Processing Laboratory developing geometric rectification and registration algorithms, and more recently, software has been developed for digital image map reprojection and image mosaicking. Image processing support for JPL's planetary program provided the basic software and procedures necessary to achieve digital image mosaicking (Elliott 1976, Johnson 1977).

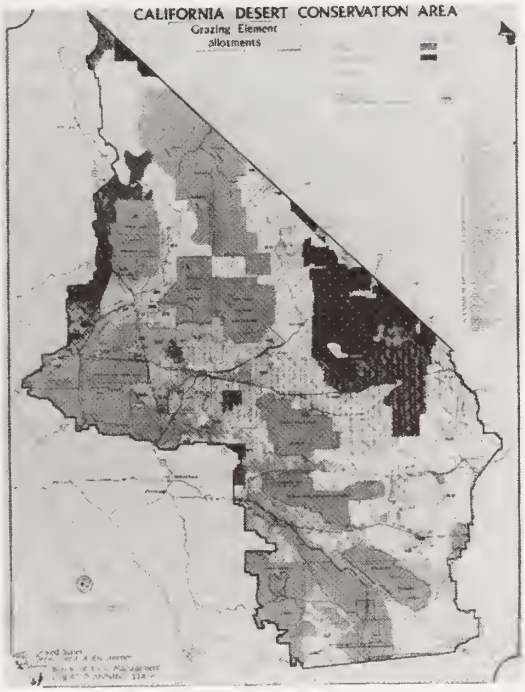


Figure 1.--The California Desert Conservation Area (CDCA) and Grazing Allotments.

[7]Earth Resources Observation System (EROS) at Sioux Falls, South Dakota is a data clearing house for NOAA, USGS, and NASA.

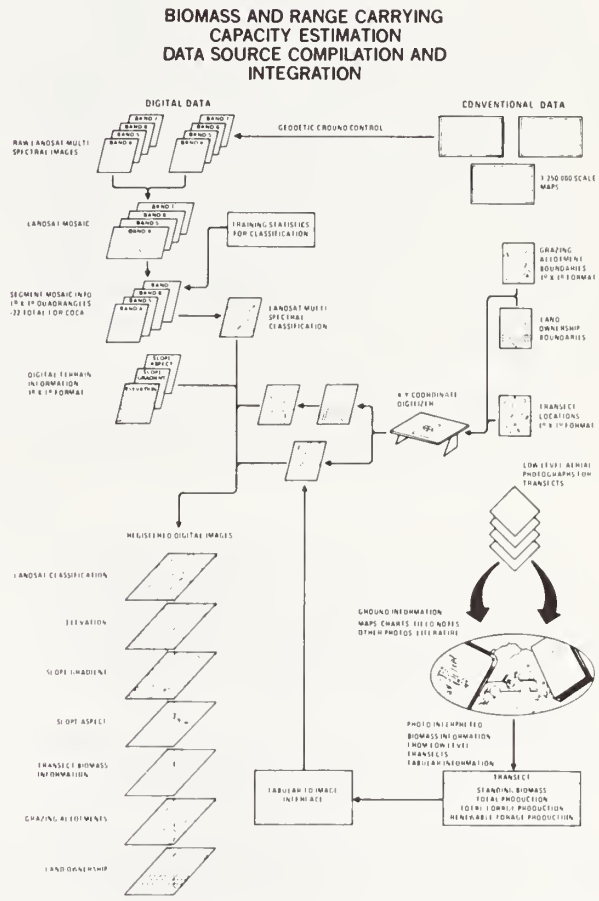


Figure 2.--Biomass and Range Carrying Capacity Estimation. An overview of data type compilation and integration.

The software system used at JPL is VICAR (Video Image Communication and Retrieval) and consists of a language translator that simplifies execution of image processing programs, a series of applications programs that include a broad range of image processing capabilities, and a series of modular subroutines used by applications programmers for data input/output, program parameter input, and other functions (Seidman 1979). The VICAR subset IBIS (Image Based Information System) is discussed in the Data Integration section of the paper. Methods have been developed that not only geometrically correct and register images in the X and Y directions but also correct adjacent frames in the Z domain (i.e., brightness). After corrections are applied to the three axes (X, Y, and Z) of the individual Landsat scenes used, a mosaicking algorithm is employed to construct a single large mosaic image.

Compilation of Data Sources

Landsat Digital Mosaic

The imagery selected for the CDCA regional mosaic were ten Landsat scenes acquired on four sequential cloud free days: August 3, 4, 5, and 6, 1976 (fig. 3). The requirements established by the BLM stated that the data should be cloud free, acquired on consecutive days, imaged during a relatively high sun angle period, and imaged at a time when there was a minimum growth of annuals that could affect signatures. Each image as received from EROS Data Center were logged into the VICAR format for continued processing. Logging consists of unleaving the data into band sequential format and performing nominal corrections for skew, mirror scan velocity

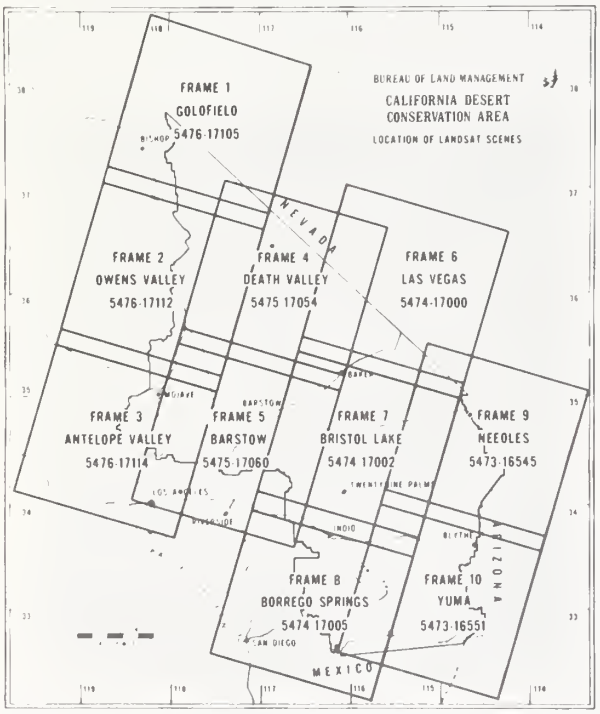


Figure 3.--Location of Landsat scenes used for the CDCA. Images were acquired on August 3,4,5, and 6, 1976.

profile, and panorama effect and adding a VICAR label to the beginning of each file. After logging, each of the images were 2340 lines by 2430 samples.[8]

Planetary mission images and the associated image rectification software differs from the Landsat MSS digital imagery in that the reprojection of vidicon images to specific map projections could be achieved by using the pointing statistics of the spacecraft and then fine tuning the local mis-registration between frames by applying a rubber-sheet geometric distortion correction algorithm a second time (Rofer 1973). In the case of Landsat mosaicking, it was found necessary to incorporate ground control points of known position in the image as well as relative registration points between frames to fine tune any local mis-registration (Zobrist 1978). The reasons for incorporating ground control points are twofold; 1) the multispectral scanner on Landsat is not a framing imaging system, so that continuous changes in pointing perspective geometry make it virtually impossible to reconstruct a perfect orthophoto image from spacecraft calibration data; and 2) the relative position of points on the Earth's surface is precisely known, with the result that geodetic control points must be used as input to geometric correction if the satellite image data is expected to conform to the planimetry of existing maps (Zobrist 1979).

A Lambert Conformal Conic map projection grid for the CDCA region was set up on a programmable calculator to establish the relationship between the image raster, Cartesian space and latitude/longitude. The grid was angled 11° east of north to follow the nominal track of Landsat and reduce the computation cost involved in rotating the large images to north. The selected geodetic control points in each of the 10 Landsat images were mapped to their respective position in the Lambert grid using interpolation between known points. A minimum of nine geodetic control points per frame were used. Converting the image data to a specific map projection allows for easy access to any portion of the finished mosaic. Coordinates of the vertices of an area requiring access are input to the programmable calculator in latitude/longitude in degrees, minutes, seconds and the X,Y (line, sample) positions of the image raster grid are returned. The inverse of this calculation is also available. This capability proved useful for detailed analysis of subareas in the CDCA.

All image data used in the CDCA mosaic were resampled to 80 meters by 80 meters in the X and Y directions to accommodate Landsat sensor and orbital characteristics, local topographic offset affects and to conform to the Lambert Conic grid. Conventional brightness corrections for satellite data are generally in the form of a standard photometric function applied over an entire frame based upon illumination angles and atmospheric interference conditions. Such procedures are adequate when radiometric calibration requiring absolute intensity values are needed. For this application of multispectral classification, a smooth brightness surface was necessary so that abrupt changes in day to day side lap areas were eliminated. A resampling of the brightness or

[8] A line consists of a line of image data and a sample consists of a column of image data.

Z values was performed based upon X,Y coordinate intensity values obtained from the relative registration points used to fine tune the mosaic. Points were interpolated between known points and input to a "rubber sheet" Z correction algorithm.

The final Landsat mosaic shown in figure 4 had the dimensions of 7400 lines by 7500 samples comprising 55.5 million pixels per Landsat band. The large volume of data necessitated that the mosaic, once completed, be broken up into manageable segments to allow efficient computing. A convention of 1° of latitude x 1° of longitude quadrangle segments was adopted, and proved useful in the subsequent registration of ancillary data. There were 22 complete or partial 1° x 1° quadrangles used for the CDCA representing 22 tape files per band dimensioned 1600 lines by 1450 samples (figs. 5 and 6).

Digital Terrain Information

The 1° x 1° quad convention permitted the registration and overlay of the National Cartographic Information Center/Defense Mapping Agency (NCIC/DMA) digital terrain files.[9] Files for the 22 quads used in the CDCA were obtained from NCIC/DMA and first logged into the VICAR format. The elevation data were then converted from halfword to byte to reduce storage and scaled in 8 bits from 0 to 10,000 feet. The data were rotated 90° to orient north at the top (no resampling). Since the latitude/longitude coordinates of the DMA terrain information is known and each point in the Lambert grid is known, the digital data could be mapped and resampled to 80 meter pixels to conform to the Landsat map projected data. After corrections were performed, images depicting measures of slope aspect and slope gradient were calculated. Figures 7, 8, and 9 show the processed digital terrain images.

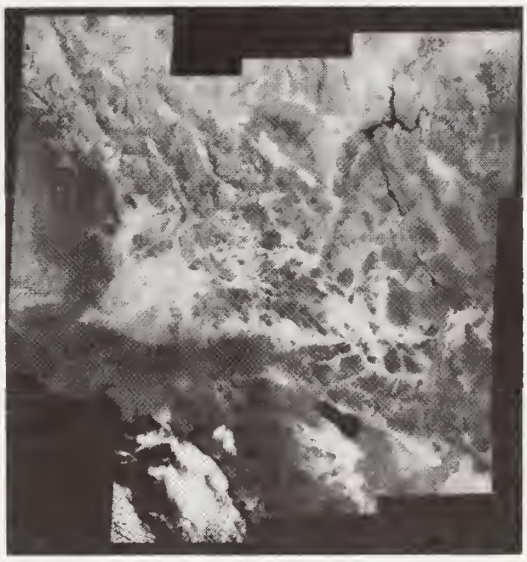


Figure 4.--California Desert digital mosaic. IR1 band, 7400 lines by 7500 samples. Two additional scenes have been added; Upper rt., Lower lft.

[9]National Cartographic Information Center. NCIC User Guide, Digital Terrain Tapes., 12pp.

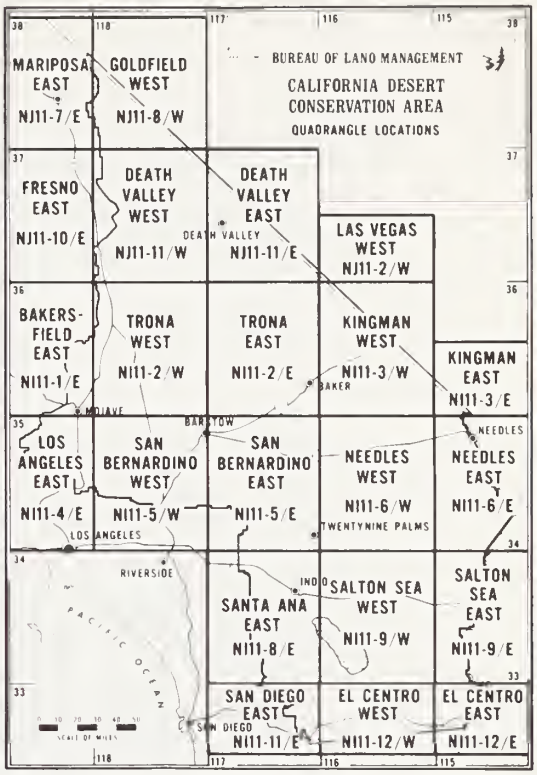


Figure 5.--1° x 1° quadrangle locations in the CDCA.

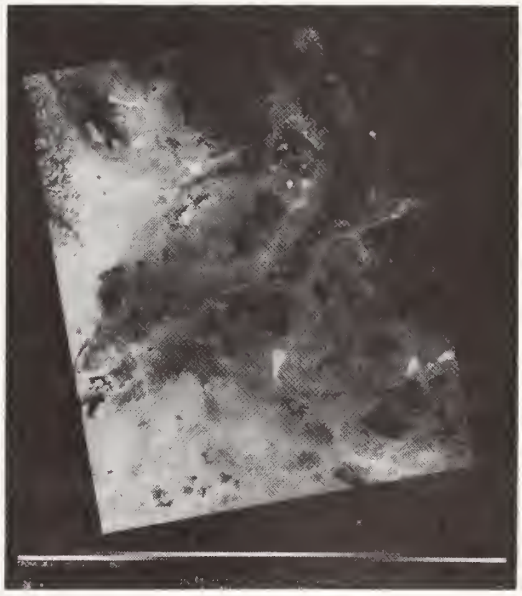


Figure 6.--An example of a quadrangle (Trona West Quad) extracted from the Landsat digital mosaic of the CDCA.

Figures 7 8 9
An example of digital terrain information for the Trona West Quad. Fig. 7.--ELEVATION - The brighter the image, the greater the elevation. Fig. 8.--SLOPE GRADIENT - The brighter the image the steeper the slope. Fig. 9.--SLOPE ASPECT- Brightness increases with azimuth (point of origin at top of image).

Ancillary Ground Information

Ground information played an important role in the biomass estimation process for the CDCA. For instance, many of the initial multispectral classifications would have to be checked and validated with other data. Site specific vegetation data from past surveys, toe point transects, and photographs were used. Additional information as available included 15 minute quadrangle sheets, 1:20,000 - 1:30,000 scale air photos, U2 aircraft photos, and habitat and soils maps.

The 15 minute quadrangle sheets were useful in many ways. First, they allowed checking of geodetic accuracy of the Landsat mosaic data base and allowed quick pin-pointing of areas for close up viewing and investigation. Secondly, the BLM staff was able to verify the registration of the digital terrain elevation data. Thirdly, the maps provided calibration for the slope gradient data derived from the elevation data.

The Desert Plan Staff realized from the begining that most reflectance patterns in a desert environment were primarily the result of surface factors, soil groups, and rock units and that vegetation probably contributed only a minor part. Thus, it would be necessary to include soils maps for understanding plant/soil group associations. Field notes, reports and slides assisted in this process.

Low Level Aerial Transect Selection

The rationale behind including low level aerial transects in the project stems from the necessity of devising an efficient way of establishing the quantitative relationship with the inherently qualitative multispectral classification. Ideally, the procedure to be used in selecting transects for biomass estimation would be to classify the entire CDCA into broad vegetation information classes and then produce a color classification map. Transects could then be located in homogeneous areas within the broad vegetational classes and biomass information could be correlated directly with spectral class. Due primarily to time constraints, many phases of this project were being handled in parallel. While the classification procedures were being developed, it was necessary to initiate a contract to fly low level color aerial photography at 1:2,000 scale with sufficient overlap for stereo viewing. Since the classification was not yet completed, the CDCA color mosaic and BLM resource photography were inspected for candidate locations for transects. Transect selection adherred to the following criteria; that the sites selected represented large areas, that smaller important riparian areas were included, that is was desirable to select transects where field information was already available. Although the process of selection was subjective at times, the main consideration was to select transects representative of the resource types BLM wanted to inventory.

The standard 9" x 9" format was set forth as a requirement and the film used was Kodak SO394 color transparencies. The overflights began in the Fall of 1978, and since 500 were selected over the entire CDCA, the flights were not completed until the early summer of 1979 (fig. 10.). As a consequence, there was a strong potential for having seasonal differences entering in and this would be particularly true in the desert with herbaceous annuals in ephemeral habits. The BLM was concerned with a vegetation inventory and classification based on perennial plants only, mostly shrubs that persist over a period of years.

Cadastral Information

Since the biomass information were later to be aggregated by land ownership and grazing allotment, conventional maps for this information had to be readied for computer input. Maps detailing landownership and grazing allotment boundaries were supplied to JPL by the BLM Desert Plan Staff in the adopted $1^{o} \times 1^{o}$ quad format. The boundaries were digitized on a coordinate digitizer, converted into images, and registered to each of the 22 quads in the CDCA.

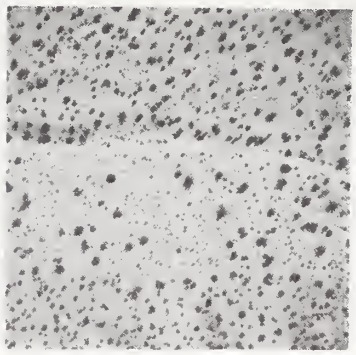


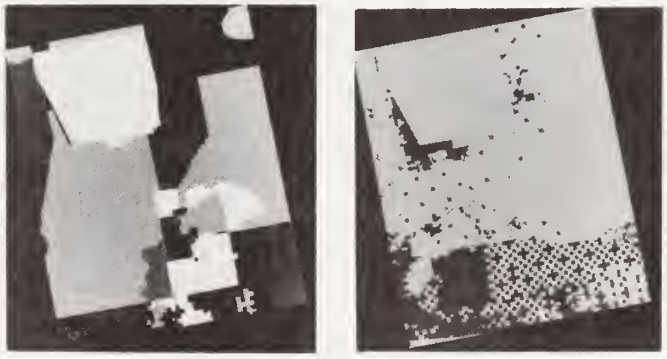
Figure 10.--An example of a low level aerial photo. Transect in the Trona West Quad. Road width is approximately ten feet.

An affine surface fit was used initially to obtain a rough fit, which proved surprisingly good, and later, local variations were corrected with a rubber sheet adjustment. On separate geo-referenced images each grazing allotment was uniquely encoded with a digital value to distinguish one grazing allotment from another. Land ownership was encoded in the same manner with two types: Public and Private (figs. 11 and 12). With the compilation of the data planes completed and registered to common raster grid, analysis, modeling, and aggregation of statistics for biomass and range carrying capacity could begin.

MULTISPECTRAL ANALYSIS AND CLASSIFICATION

The arbitrary nature of essentially all resource classification schemes (ground base and otherwise) was tacitly accepted at the outset. Thus, during the initial phases of establishing the training statistics, little concern was shown for trying to establish spectral clusters that corresponded to known resource types. Typal classifications of natural biological resources (vegetation, habitats, etc.) are most often only intuitive in substance and seldom adequately quantified. This condition has contributed to the difficulties for testing Landsat classifications as observed by Maxwell (1976) working with vegetation production in Colorado, Bentley et. al. (1976) working with vegetation and soils in Arizona and Montana and Hutchinson (1978) striving for an integrated survey method in the Mojave Desert of California. Extreme variability within the ground control classes commonly leads to improper evaluations on how well Landsat can define and discriminate resources.

A basic assumption is made when multispectral classification is used. Spectral reflectance patterns are related in a rational way to resource characteristics and that from this relationship, practical classification schemes can be developed. The first goal in proceeding with the digital multispectral classification then becomes one of establishing a set of spectral cluster statistics that embrace the entire range of spectral reflectance intensities and patterns found in the data set for the CDCA. There is a need for such a fine grained approach. It is critical to derive enough clusters to separate essentially all signatures that might correspond to special purpose resource classes desired for practical applications. The underlying principle of this approach is the opposite of the null hypothesis most commonly used in statistics (type 1 error) but instead relies on minimizing the chances of inadvertently aggregating samples that are different (type 2 error). In terms of the splitter taxonomists, "It is a greater sin to call things that are different the same than to call things that are the same, different." A modified, unsupervised, purely statistical classification was performed to deliver an initial classification of enough discrete classes to separate all resource cover types known to the BLM resource specialists. Even though desert regions are characterized by stable atmospheric conditions for long periods, similar habitats are known to develop changes in plant species composition and abundance over several degrees of latitude and similar changes occur in reflectivity signatures for similar type areas. It was necessary to develop a system of linear transect sampling as a means to assure uniform classification statistics with sufficient discrete classes to include all known resource types. The initial pixel brightness values for all four MSS Landsat bands were extracted in two pixel wide swaths along approximately 3,000 miles of transects delineated by the BLM science team to include all variable types in the landscape (figure 13). This technique is analogous to the Multi-Cluster Blocks approach reported by Fleming and Hoffer (1977) in which the training blocks are selected for their heterogeneity



Figures 11 12
An example of the boundary files for Trona West Quad. Fig 11.--Grazing Allotments displayed in four grey tones. Fig 12.--Land Ownership: Public--light tone, Private--dark tone.

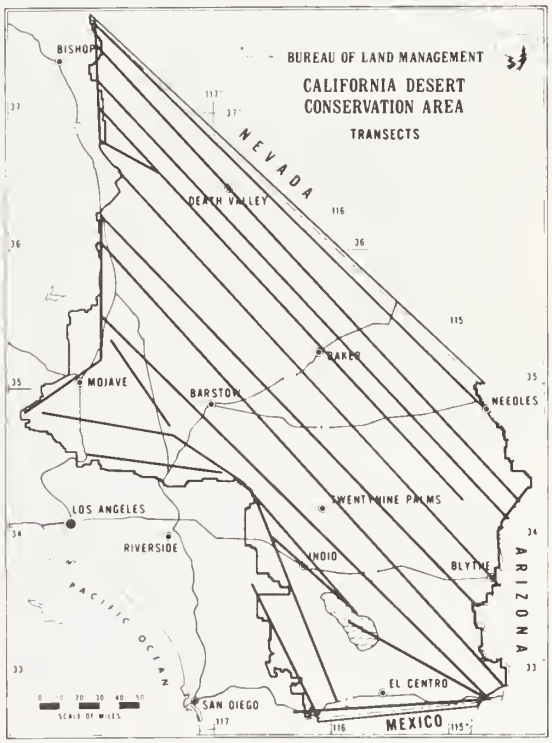


Figure 13.--Sampling transect locations in the CDCA

rather than homogeneity. The transects traversed all types of terrain elevation, slope gradient and aspect, and the various cultivated and populated areas. The transect data were then aggregated into a small (360 samples by 410 lines) image per Landsat band and represented a 0.5% sample of the CDCA. An unsupervised clustering algorithm was employed on the entire small 0.5% sample image resulting in the separation of 1993 initial clusters. Timing for the clustering was approximately 500 cpu minutes on an IBM 360/65.

The unsupervised clustering algorithm which builds up clusters as it passes through the training set was designed to limit the growth of clusters, providing a large set of initial clusters. The initial cluster data set displayed the very broad range of reflectivity values found in the California Deserts. Much of the CDCA is sparsely vegetated, i.e., has less than 10% plant ground cover, and the maximum ground cover rarely exceeds 50% except in cultivated lands which were of little concern to BLM scientists. Riparian areas, with the higher percentage ground cover values, though comparatively small in extent, are of significance in terms of total plant productivity and related range carrying value.

Cluster Reduction

The task of reducing the 1993 clusters to a manageable number became a problem of devising a way to retain significant but small population clusters having a strong vegetative component in their signatures. It is generally known that such clusters should be those with comparatively low reflectance in the visible red band (MSS 5) and high reflectance in the infrared bands (MSS 6 and 7). The goal of obtaining 100 principle clusters from the initial 1993 was established by the JPL and BLM science team for the reason that 100 was a small enough number to efficiently manage and yet retain the diversity of critical elements needed to define the CDCA landscape. In addition, the limit of 100 clusters to the classification algorithm was set to reduce the potential for incurring exhorbenant computing costs. To this end, the 1993 initial clusters were separated into groups based upon the strength of the vegetative component of spectral signatures as indicated if one or both of the infrared bands contained greater reflectance signatures than the visible band. If the visible band was greater than the infrared bands, the vegetative component of the signature was assumed to be nonexistent. If the ratio of MSS band 6 to MSS band 5 was greater than or equal to one, the clusters were determined to represent a plant type signature, and if the ratio was less than one, the clusters represented a non-plant signature. In summation:

$\frac{MSS6}{MSS5} \leq 1$ indicates a plant signature;

$\frac{MSS6}{MSS5} > 1$ indicates a non-plant signature.

The partitioning separated the clusters into 684 vegetation reflecting clusters and 1309 non-vegetation reflecting cluster signatures. Each resultant group was broken down further into two groups to yield four final cluster groups. Of the vegetative reflecting signatures, ($MSS6/MSS5 \leq 1$), these signatures were separated into groups where MSS band 7 was greater than or equal to MSS band 5, representing a very high vegetative component signature containing 363 clusters and where MSS band 7 was less than MSS band 5 such signatures represented a high vegetation signature with a population of 321 clusters. The non- or low vegetation clusters ($MSS6/MSS5 > 1$) were separated into two groups on the basis of whether MSS band 5 brightness was greater than 130 on a pixel brightness scale of 0-255, and yielded 690 clusters. Such signatures represented very bright surface conditions such as playas and sand. The second group was separated as to whether MSS band 5 was less than 130 yielding 619 clusters. These signatures represent dark surface features such as shadows and basalt flows. This strategy resulted in partitioning the 1993 initial clusters into four groups representative of major signature types in the CDCA as shown in table 1.

The reduction of the clusters to approximately 25 clusters within each of the four groups was performed by merging overlapping clusters and deleting the population and associated statistics of clusters where the mean value occurred within the one standard deviation ellipse of a cluster with a larger population. Each of the four groups were merged separately in order to assure that population size and standard deviation would not dominate the merging process. Important low frequency pixel clusters representing strong vegetation signatures were thus retained to be used in the classification process.

Testing the Statistics

Rather than immediately classifying the entire CDCA, (an expensive procedure) the cluster statistics were first tested in sample areas to see if they were appropriate. The one hundred clusters selected for the CDCA were used as input to a hybrid Bayesian/Parallelepiped type classifier and applied to four primary test areas selected in the CDCA (Addington 1975). Each test area was 512 lines by 512 samples comprising over 400,000 acres each. The test areas were selected by the BLM Desert Plan staff for their diversity and representativeness of the varieties of landscapes found throughout the CDCA and on the basis

Table 1. -- Relative percent of pixels and clusters in the band ratio-brightness categories from the transect sample training set.

	LANDSAT BAND RATIO-BRIGHTNESS CATEGORIES			
	1	2	3	4
	Band 5 ≤ Band 6	Band 5 ≤ Band 6	Band 5 > Band 6	Band 5 > Band 6
	Band 5 < Band 7	Band 5 > Band 7	Band 5 ≤ 130	Band 5 > 130
Percent of Pixels	6%	12%	52%	30%
Percent of Clusters	18%	16%	35%	31%

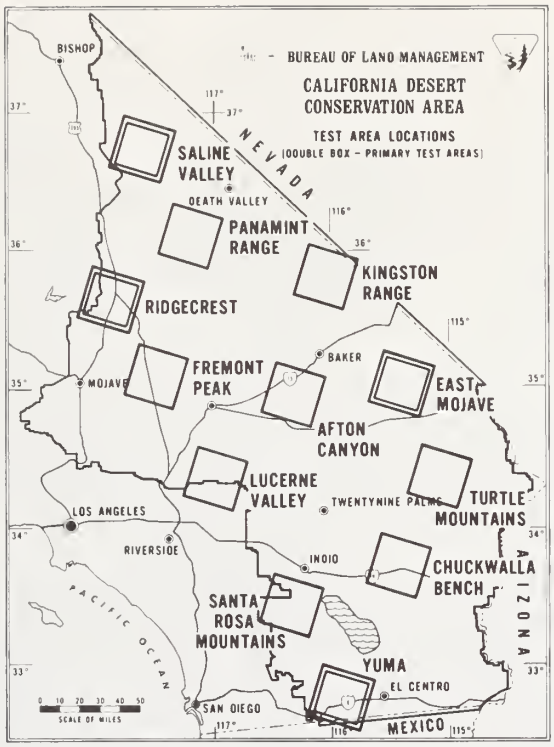


Figure 14.--Location of 512 x 512 pixel test areas.

of available ground information. The spatial distribution of the classes as output from the multispectral classifier were examined for each of the test areas by the BLM staff at JPL on the General Electric Image 100 interactive system. The objective in examining the classes was to determine if:

1) The spectral patterns corresponded to any known distribution peculiar to vegetation groups and plant communities;
2) any inconsistencies in classes were apparent due to the effects of latitude, elevation, slope gradient and slope aspect.

Aided in these determinations with extensive supplemental ground information collected through field surveys and low altitude aerial photography, the BLM staff was able to assign names to the classes and then decide which classes needed merging, expanding, or deletion. Final classification thresholds for the entire CDCA were set at 3 sigma for each cluster for input to the classification algorithm.

The ground information helped spot inconsistencies in classes from test area to test area. It was found, for instance, that with the aid of the registered NCIC/DMA elevation data, many of the inconsistencies in class assignments were resolved. Perennial range type is usually found above 3500 feet in the CDCA while ephemeral range type is generally below 3500 feet. In addition, changes in stratification based on elevation for communities with similar reflectance characteristics often occurred between those test areas in the high desert to the north and in low desert areas to the south.

The 100 class maps for each of the test areas were of such fine detail as to be cumbersome. Classes of like signatures and pattern distribution as determined by the BLM staff were merged, and with the aid of the elevation data to resolve inconsistencies, were collapsed into 28 final vegetation information classes. Each test area was collapsed independently to give a "best fit" for its representative part of the desert. Eight secondary test areas (512 lines by 512 samples) were examined to fine tune this procedure and to insure consistency throughout the entire CDCA. Once the BLM staff was satisfied with class assignments to vegetation types, the respective maps were generated for each of the 22 1° x 1° quads for the CDCA. As a result of the first four test areas and second eight test area experiments, the existence of a systematic drift in signature characteristics from north to south and from east to west was shown. The quads were assigned to each of four quad groups for class reduction to 28 classes.

The quad groupings as shown in figure 15 represent the four major regions of the CDCA as defined by the BLM desert Plan Staff.

Group 1 North Mojave
Group 2 East Mojave/Colorade
Group 3 Yuha
Group 4 West Mojave

Each of the four groups were stratified independently in order to tailor the spectral classes to the region. An example of an inconsistency was apparent in the Imperial Valley shown in Group 3. Pinyon-Juniper signatures, characteristic of the nearby Santa Rosa Mountains, were appearing in the agricultural lands of the valley. An elevation stratification was used to delete any pinyon-juniper signatures

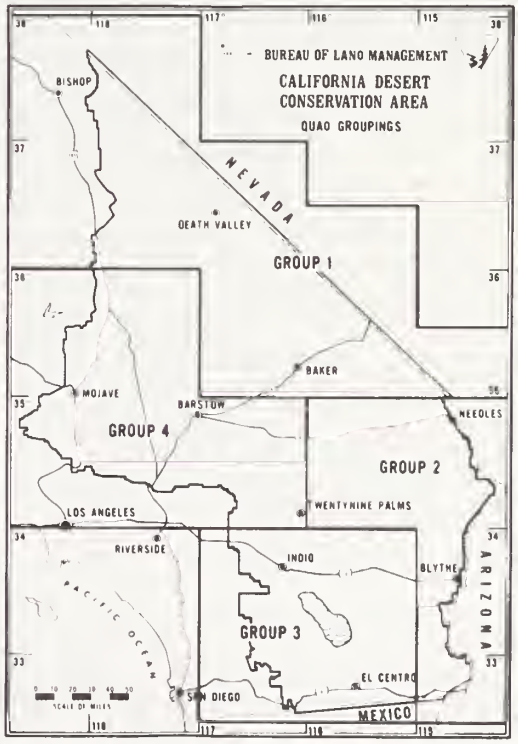


Figure 15.--Quad groupings used in stratifying multispectral classification.

below 40 feet. The gaps that resulted from this operation were filled with neighboring classes as appropriate.

LOW LEVEL AERIAL TRANSECT ANALYSIS AND INTERPRETATION

Large scale aerial photos were used to estimate the biomass and production of perennial plants for selected transects throughout the desert. The goal in the Production/Biomass estimation of perennial plants was to determine range carrying capacity for livestock in designated allotments. The ephemeral component of forage productions, i.e., winter and summer annuals, cannot be estimated on a yearly basis due to the extreme variability of moisture and temperature.

In order to arrive at a quantitative interpretation of the Landsat classification for the purpose of estimating range carrying capacity, it was necessary to extract several types of botanical data from the photo transects. These data included:

1. Species composition--a list of species that were present in the transect;
2. The amount of each species present in terms of percent ground cover;
3. The height of the species present;
4. Volume and inferred density of the species present, derived from the cover and height.

It was important to insure the accuracy of species identification in order to relate Production to Biomass. Extensive use was made of field information regarding what plants were present for transects that had been visited. Height was determined from stereo viewing, but was usually done in a relative sense rather than absolute sense owing to some variability in the scale of the transects. By using well known plants as indicators, the height could be estimated rather closely.

With the initial extraction of this data from the transects, it was possible to obtain a value of Standing Biomass in kilograms per hectares (kg/ha). Biomass was determined for the transects through volume measurements related to volume density equations obtained for a spectrum of indicator species (figure 16). However, the biomass values by themselves are not directly useable for determining carrying capacity for livestock. Considerations for both production and palatability to livestock are also important. The task then became one of determining the relationships among biomass,

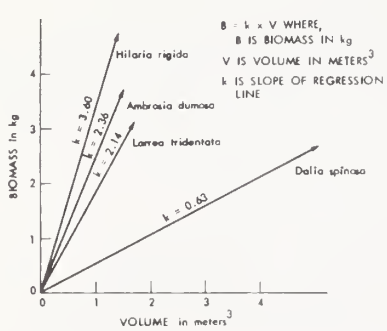


Figure 16.--An example of volume to weight (biomass) relationships for four indicator species. (Storey 1969; Wallace 1972; Garcia-Moya 1970)

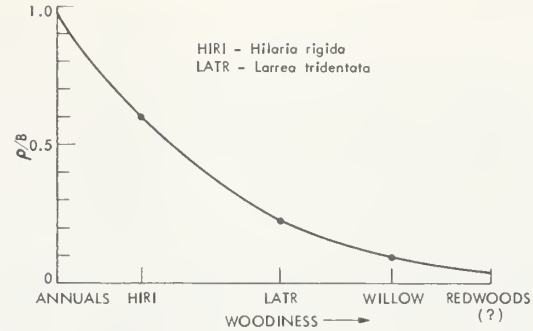


Figure 17.--An example of Production to Biomass (P/B) relationship used in determining Total Production levels of sample transects.

production and palatability.

In the early 1970's, the International Biological Program, Desert Biome portion exerted considerable effort in making measurements of various types on desert plants. Some of the research reported on the relationship between biomass and production for various species. Biomass and production are considered to be positively correlated as a function of woodiness (figure 17). With the production to biomass ratios established for species within the transects a value of Total Production in kg/ha could be ascribed. This value is an estimate of new growth for a year. Taking into account livestock grazing preferences and consulting palatability tables, the production for plant species grazed by livestock was estimated in kg/ha and this value reflected Total Forage Production. After deciding which species were forage producers, proper use factors were assigned each species. The proper use factor, when included, defines the amount of forage that can be consumed by livestock and yet preserve plant production in a sustained yield basis. Palatability and proper use tables have historically been developed over the years by the BLM, particularly, the Riverside District office, Las Vegas District office and the Kingman Arizona District office. The proper use factor for species was multiplied by the Total Forage Production for species to obtain values of Renewable Forage Production.

DATA INTEGRATION

Once the CDCA had been classified into broad vegetation information classes, the task remained to assign biomass/production values to each class in a region. A technique of back-classification was used to do this. The positions of the transects were plotted on stable base enlargements of each of the 1° x 1° quads used and were digitized. Locating the coordinates was aided with 1/20,000 to 1/30,000 color and black and white aerial resource photography available from the BLM files. After digitizing, locational accuracy was verified on a CRT and supplemented with pixel by pixel listings for selected transects. This was necessary due to the small size of the transects; approximately 40 Landsat pixels. Each transect was then uniquely encoded to identify one from the other and overlaid on the 28 class map. Class values for each transect were tallied and stored in a tabularly formatted IBIS file. An important tool in the data integration phase was the IBIS (Image

Based Information System) software package, a subset of VICAR. IBIS is the tabular to image, and image to tabular link in which disparate data types may be compared (Zobrist January 15, 1978). This procedure was repeated for all quads with transects and the output files concatenated to produce a final working file with vegetation information class counts for all transects.

The optimal situation in assigning biomass values to the vegetation information classes would be to have the transects contain homogeneous information, i.e., all the same class per transect. With such a configuration, the interpreted biomass value could be correlated directly with the class residing in the transect. However, in the CDCA case, many of the transects were hetereogeneous, posing some basic difficulties in the back-classification methodology. Utilizing the flexible capabilities of the VICAR/IBIS software, biomass values for spectral classes were averaged over several transects within groups of 1° x 1° quadrangles and weighted by spectral class frequency.

Quadrangle groups for biomass class assignment differed from the quadrangle groups used in collapsing to 28 vegetation information classes because biomass class assignment groups were based on the quads in which there were interpreted transects. By and large, the two grouping schemes are quite similar. The quads which contained transects and the quad groupings are:

Bakersfield East Trona West San Bernardino West	Group 1
Death Valley West Goldfield West	Group 2
Kingman West	Group 3
Needles East	Group 4
Salton Sea West	Group 5

Biomass would then be tabulated for grazing allotments based upon which quad group each allotment was contained in or adjacent to.

In most cases, if more than one class was present in a transect, it was found that those classes were closely associated in vegetation information and could logically be averaged together. This could be justified based on the continuous nature of vegetation. Transects that could not be logically averaged due to class separability were deleted as were transects with no accompanying biomass values. The total number of transects used after editing was 238. In some cases, the composition of spectral class values for all transects in a quad or quad group did not consist of all 28 possible classes, thus leaving gaps in the biomass value assignment. Those were classes that had a very low population and were not captured in the transect sampling strategy. This proved insignificant as those nonsampled classes generally comprised less than one percent of each allotment. This procedure was repeated for Total Production, Total Forage Production, and Renewable Forage Production. Initial tabular reports were generated for BLM Desert Plan Staff inspection and approval.

DATA AGGREGATION

Once biomass values had been assigned to the 28 vegetation information classes for the CDCA, the spectral class map was considered a biomass map. What remained was to tabulate biomass by the grazing allotments leased by the BLM. In addition, it was necessary to obtain biomass values by land ownership (Public and Private) as well as slope gradient. Such information required the intersection of four data sets resulting in 12,768 possible entries. There were two entries for land ownership, three for slope gradient, 28 for the spectral biomass classes, and 76 for grazing allotments. Although there are only 53 allotments, additional areas such as military reservations and bases, national monuments, state parks, and Indian reservations were included. The slope gradient image derived from the DMA terrain data was found difficult to use unless broken into three categories. The categories selected by the BLM staff were 0-25%, 26-50%, and greater than 50% slope. These corresponded to the traditional slope classification used in range suitability determination. Allocations can be made for livestock if the land under consideration has a 0-25% slope as determined by the digital terrain slope gradient information. The 0-25% category embraces essentially all the terrain accessible to livestock. Land with greater than 25% slope was allocated solely to wildlife.

Overlays for the four data sets were performed on each of the 22 1° x 1° quadrangles used in the CDCA to obtain information listing spectral class (biomass) by 1° x 1° quadrangle for grazing allotments, land ownerhsip, and slope category. This resulted in 22 intermediate disk files (one for each quad) which were concatenated into one master file to simplify the data management. Since many grazing allotments were not contained within the confines of a single quad it was necessary to tabulate accross quad borders, an operation made possible when the data is tabularly formatted.

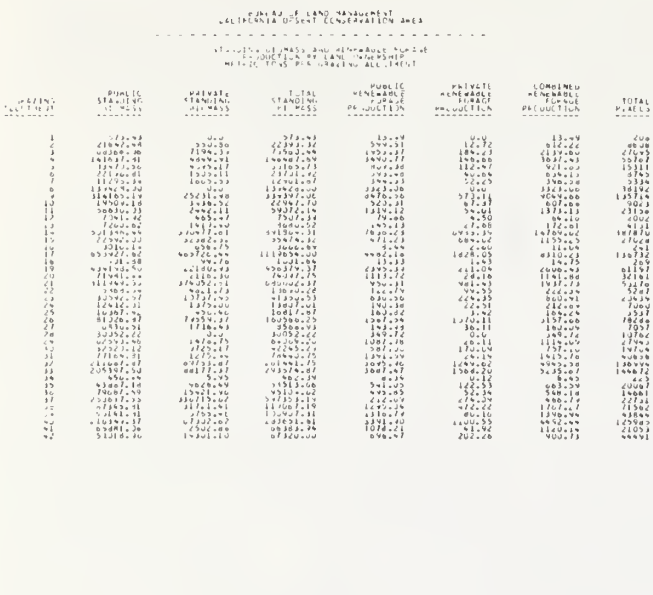
Since the assumption of signature extension in such a wide and diverse area such as the CDCA is not valid, it was necessary to tabulate biomass for grazing allotments based on which of the five basic quad groups each grazing allotment was located. Biomass classes were aggregated for grazing allotments to derive total metric tons of biomass types (table 2). These tabular reports were sent to the BLM Desert Plan Staff for inspection and approval.

The biomass figures when converted to AUMs were governed by additional BLM procedural criteria derived from conventional sources. An area was not allocated if: it was greater than four miles from water; had less than 25 pounds of forage per acre; and as mentioned earlier, greater than 25% slope.

OBSERVATIONS AND RESULTS

Since the inception of the Landsat program in 1972, the literature has seen a wide variety of experiments an demonstrations describing the utility of Landsat data. These experiments have laid the ground work in developing procedures by which Landsat data could be displayed, analysed, and

Table 2.--An example of a tabular listing depicting Standing Biomass and Renewable Forage Production by land ownerhsip for selected grazing allotments.



reduced. Furthermore, it has been shown that, while Landsat is an attractive data source in its own right, it has fallen short of the great expectations that many investigators harboured. It became clear that spectral information alone contained too much ambiguity and that several data types needed to be integrated in order to model complex landscapes reasonably well. In the case of the CDCA, Landsat worked well in delivering a qualitative interpretation of the desert in terms of broad vegetation classes at relatively little expense, the basic product being the 28 class vegetation map. It was found necessary to quantify the generalized Landsat classification in terms of biomass production with the specific information obtained from the low level aerial photo transects in order to increase the utility of this data for input to the CDCA Plan.

The results of this project, statistics and estimates for range carrying capacity for grazing allotments, have been used as basic data for the California Desert Conservation Area Plan. This has been an actual application funded and designed by the BLM, not an experiment or demonstration. The entire budget for all sections of the Plan was on the order of $8 million with approximately $200 thousand devoted to Landsat based technology developed at JPL. The duration of the project was approximately 2 1/2 years.

One of the mandates of the Act is to provide for monitoring and periodic updates of the data. In the future, such updating will be made easier since the data base is already compiled and computer compatible. Barring any major climatic changes resulting in large changes in perennial plant distributions, the same Landsat data could be used with updated transect flights. It necessary, subsequent Landsat scenes could be integrated with ease into the existing data base.

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COSMIC
Computer Center
112 Barrow Hall
University of Georgia
Athens, Georgia
Telephone: (404) 542-3265

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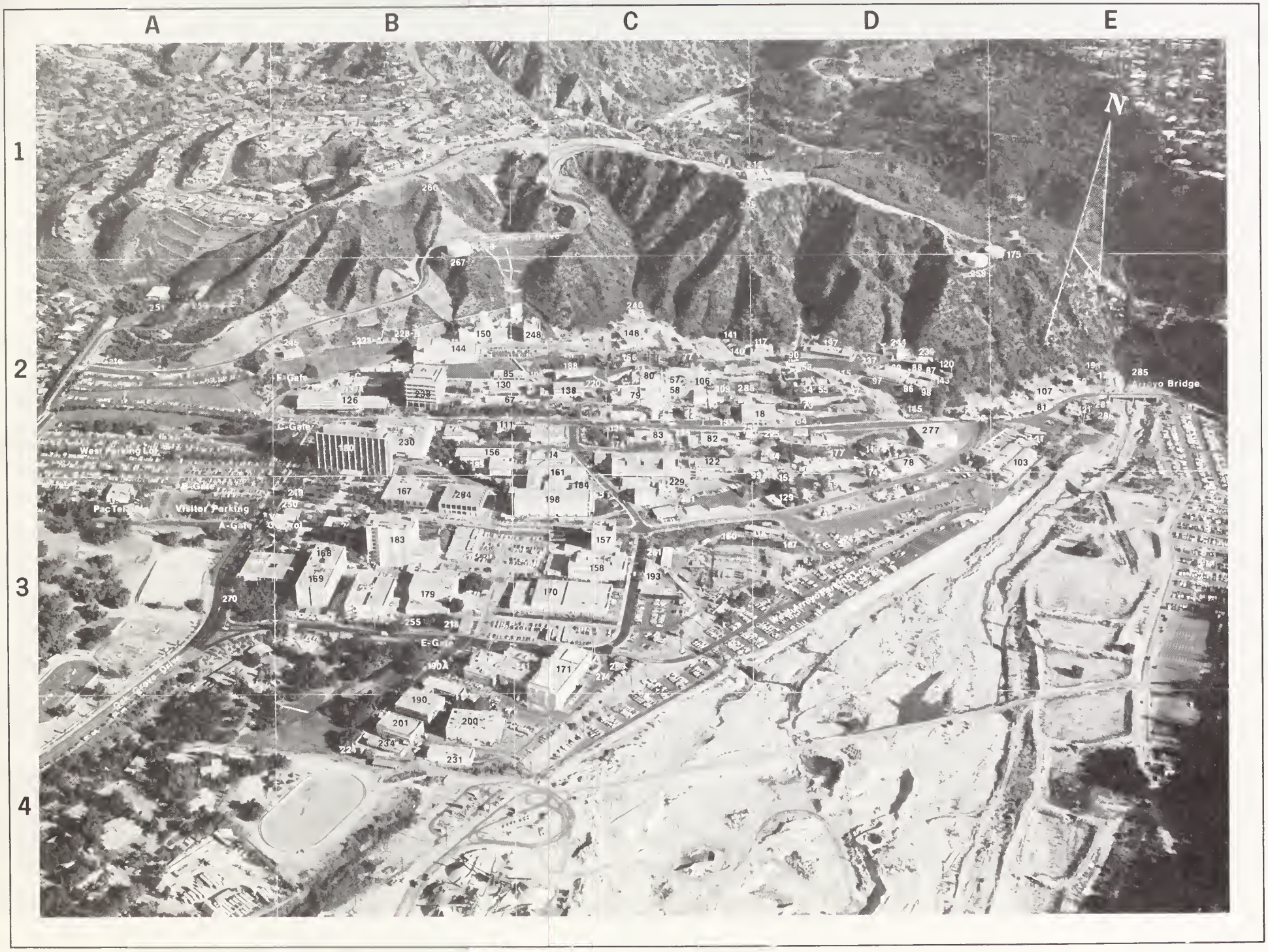
A
B
C
D
E
1
2
3
4
N
Arroyo Bridge
E-Gate
C-Gate
West Parking Lot
B-Gate
Visitor Parking
A-Gate
Pac Tel Site
Oak Grove Drive

LEGEND

Bldg. No.	Title	Location
11	Space Sciences Lob	E-2
13	Offices, Lab & Shop	D-3
18	Structural Test Lab	D-2
20	Shop Test Cell No. 2 (Liq)	D-2
23	Shop Test Cell No. 12 (Liq)	E-2
31	Test Cell (Liq)	E-2
32	Test Cell (Liq)	D-2
33	Test Cell (Liq)	D-3
34	Shop Test Cell No. 33 (Liq)	D-3
35	Mag Flux Tank Shelter	B-1
41	Hi-Temp Lab	D-3
42	Test Cell (Liq)	D-3
46	Shop Test Cell No. 42 (Liq)	D-3
47	Plant Protection	D-2
53	Conditioning Lab (Solid)	D-3
54	Blending Lab (Solid)	D-2
55	Mixing Lob (Solid)	D-2
57	Test Cell (Air Fuel)	C-2
58	Compressor Bldg	C-2
59	Chemistry Lab	D-3
65	Materials Lab	D-3
67	Microbiology Facility	B-2
71	Mechanics Stores	D-2
72	Engineering Offices	C-2
73	Utilities Area Storage	D-2
74	Test Cell (Chemistry)	D-3
77	Soil Science Lab	C-2
78	Hydroulics Lob	D-3
79	Wind Tunnel (20 inch)	C-2
80	Wind Tunnel (21 inch)	C-2
81	Battery Laborotory	E-2
82	Environmental Test Lob	C-2
83	Electronic Parts & Engineering	C-2
84	Test Cell & Solid Chemistry	D-2
85	Business Systems Office	C-2
86	Oxidizer Grinding (Solid)	D-2
87	Ovens (Solid)	D-2
88	Mixing Lab (Solid)	D-2
89	Processing Lab (Solid)	D-2
90	Shop Test Cell No. 51	D-2
91	Air Dryer (Wind Tunnel)	C-2
92	Cooling Tower (Wind Tunnel)	C-2
93	Vaporizer (Wind Tunnel)	C-2
97	Development Lab & Offices	D-2
98	Preparotion Shop (Solid)	D-2
99	Chemistry Lab (Solid)	D-3
103	Fabrication Shop	E-3
106	Test Cell (Air Fuel)	C-2
107	Test Cell	E-2
109	Cooling Tower (Wind Tunnel)	C-2
110	Fuel Stor Tank	C-2
111	General Offices Bldg	B-2
114	Cafeteria & Offices	C-3
115	Heating Plant (Solid)	D-2
116	Propellant Storage Dock	D-3
117	Test Cell (Solid)	D-2
118	Cooling Tower	C-3
120	Cooling Tower	D-2
121	Employment Development Ctr	E-2
122	Engineering Offices	C-3
125	Combined Electronics	C-3
126	Systems Div Office Bldg	B-2
129	Test Cell (Chemistry)	D-3
130	Engineering Offices	C-2
133	Service Dock	C-2
134	Shop Test Cell	E-2
135	Guard Shelter	A-2
136	Cooling Tower	C-2
137	Cooling Tower	C-2
138	Engineering Offices	C-2
140	Magazine X Temp	C-2
141	Magazine X Temp	C-2
145	Magazine Propellant	D-2
147	Cooling Tower	D-2
148	Energy Conversion Lab	C-2
150	25-ft Space Simulator	B-2
152	Hazardous Chemical Stor	C-3
156	Computer Program Office	B-3
157	Engineering & Mechanics Bldg	C-3
158	Material Research Proc-Lab	C-3
159	Pump House (Water)	E-2
160	Sewage Lift Station	C-3
161	Telecommunications Lab	C-3
165	Cooling Tower	C-3
166	Cooling Tower	C-2
167	Cafeterio	B-3
168	Space Sciences Instrm't Sys Lab	B-3
169	Engineering Office Bldg	B-3
170	Fabricotion Shop	C-3
171	Materials Service Bldg	C-4
173	Test Shelter	E-2
174	Cooling Tower	C-2
175	Water Reservoir	E-2
177	Tronsportation Goroge	D-2
179	Spacecraft Assy Facility	B-3
180	Central Engineering Bldg	B-3
182	Bus Stop Shelter	E-2
183	Physical Science Lab	B-3
184	Electronic Stores	C-3
185	Programming Office	B-3
186	Space Sciences Div Bldg	A-3
187	Chemical Storage	D-3
188	Engineering Facilities Bldg	C-2
189	Electronics Lab-Annex	C-3
190 — 190A	Procurement Offices	B-4
191	Hazardous Test Bay	E-2
192	Propulsion Engineering	D-3
195	Guard Shelter	B-3
196	Guard Shelter	B-2
197	Solid-Propellant Process Lob	D-2
198	Guidance Lab	C-3
199	Celestial Simulator Bldg	C-3
200	Plant Engineering Services	B-4
201	Carpenter Shop	B-4
202	Procurement Offices	B-4
209	Illuminotor Tower	D-1
210	Blaine Track	D-1
212	Antenno Lab	D-1
213	Cooling Tower 'A','B'&'C'	B-2
218	Credit Union	B-3
220	C.R.S. Terminal Bldg	C-2
224	Sewer Lift Station	B-4
225	Guard Shelter-Mesa	C-1
226	Solvent Storoge Bldg	C-2
227	Guard Shelter	B-1
228	Cooling Tower (A & B)	B-2
229	Shielded Room Bldg	C-3
230	Space Flight Operations Facility	B-2
231	Paint Shop	B-4
233	Spacecraft Development Bldg	B-3
234	Lumber Stor Bldg	B-4
237	Cooling Tower	D-2
238	Telecommunications Lab	B-2
239	Low-Temp Solid Prop Mag	D-2
241	Shipping & Receiving	B-4
243	Remote Antenna Range Contr	B-1
244	Hi-Temp Stor Mag	D-2
245	Spectroscopy Lab	B-2
246	Soils Test Lab	C-2
248	10-ft Space Simulator	C-2
249	Visitors Reception Bldg	B-3
250	Guard Shelter	B-3
251	Gyro Lab	A-2
253	Low-Mag Interference Lab	A-2
255	Sewage Lift Station	B-3
256	Madel Range Control Bldg	B-1
257	Guard Island	B-3
258	Water Reservoir	E-2
259	Liquid Nitrogen Bottling Stor	D-2
260	Illuminator Equipment Bldg	B-1
261	Material Storage	C-3
262	Radiometer Bldg	B-1
263	Protective Services Bldg	C-3
264	SFOF Sys Dev Lab	B-3
267	Woter Reservoir	B-2
268	Pump House	B-1
269	Grounds Maintenance Bldg	C-4
270	Sewage Metering Stotion	A-3
271	Oil Barrel Stor	C-3
272	East Illuminotor Bldg	C-1
273	East Illuminator Tower	C-1
274	Cooling Tower	C-3
275	Chemical Stor Prop Bldg	D-2
276	Chemical Stor Prop Bldg	D-2
277	Isotope Thermoelectric Lab	D-2
278	Helicopter Maint Hangar	C-3
279	Guard Islond	B-3
280	Stotic Test Tower	D-2
281	Fireman / Guard Station	C-3
283	Metal Storage Building	C-3
284	Transportatian Office Bldg	D-2
285	Arroyo Bridge	E-2
286	Guard Bldg, Arroyo	E-2
287	Island Guard Bldg	E-2
288	Project Equipment Storage	C-2
	'A' Gate	A-3
	'B' Gate	A-3
	'C' Gate	B-2
	'D' Gate	E-2
	'E' Gate	B-3
	'F' Gate	B-2
	'G' Gate	A-2